ENGLISH FOR ENGINEERS

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TO

MY FATHER AND MOTHER

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PREFACE

The object of this textbook has been to make the study of English definite for the engineering student, and to stimulate his interest in a brief but comprehensive survey of the immediate uses to which English may be put by the engineer. It is intended to acquaint him with the sources of English study both for professional and cultural needs and interests. Just before he goes out into the industries, a final study of English is invaluable. At this time, he will profit by pausing long enough to take a final inventory of his education and personality for their economic value. English will give him the opportunity for making his self-analysis. He needs English, also, to counteract the stultifying effect of unrelieved technical training and study. He must retain his initiative and develop his personality and qualities for leadership if he is to handle successfully not only the technicalities but also the broad human aspects of engineering.

It has not been the intention of the author that the engineering student should depend entirely upon this one textbook, but that he should rather take it as a guide to a large field of material for individual thought and study in the effective presentation of ideas and "the best that has been thought and said in the world." Indeed, if his English becomes only another study that furthers the standardization of his mental processes and tends to submerge his individuality, the best value of English for him is lost. To stimulate, therefore, his own thought, and to increase his range of reading and thinking, collateral readings have been suggested in connection with every chapter. The aim throughout the entire book has been to make the student want more for himself; "to lay the basis for subsequent and more definitely specialized intellectual endeavor."[1]

The arrangement of the various sections of the book has been determined by the interests and needs of the students, not by the logical sequence of the subject matter. The purpose which has been found successful in actual teaching—has been, first to differentiate this study of English from any which the technical student has previously made and to catch his attention, through the letter of application, by an appeal to an immediate use for English; next, to emphasize, through the telegram, the value of certain rhetorical qualities—conciseness and clearness; then to stress, through the order letter, the desirability of good display and layout. By these three forms of business communications, the English teacher can motivate the review in rhetorical fundamentals, and make the study of English tangible for the technical student. After the teacher has secured by these means the confidence and cooperation of his students, he can easily proceed with the types of letters and the other forms of writing which require detailed study of personality and rhetorical qualities and methods.

To keep the teaching live and convincing, the English teacher will use this textbook as his guide to the sources of information upon the interests and objectives of practicing engineers. He will get a vision of the profession in which his students are interested and in which they expect to work, from his reading of technical periodicals and from his natural friendships with engineers. By timely references and discussions, as well as by sincere sympathy and understanding of the engineer's problems and aspirations, he will make his students firm in their faith that engineering is one of the great professions.

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[1] From the brief address of Secretary of State, Charles E. Hughes before the National Educational Association, Boston, 1922.

The author is indebted to several friends who have read the manscript and have made helpful and stimulating suggestions. These friends are Professor Thomas B. Stanley, New York University School of Commerce and Finance; Professor C. W. Park, University of Cincinnati; Professor J. Raleigh Nelson, University of Michigan; Professors J. V. Denney, F. W. Marquis, C. E. Sherman, Dean E. A. Hitchcock, J. M. Weed, all of the Ohio State University.

Finally, no expression of acknowledgment would be complete without a word of appreciation of the interest and active cooperation of friends—colleagues, administrative officers in technical schools, practicing engineers, leaders in industry, and engineering students—here and in many other sections of the country. Their confidence and aid have been a never-failing source of encouragement to the author in the study of English for engineers.

S. A. HARBARGER.

OHIO STATE UNIVERSITY,
May, 1923.

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ENGLISH FOR ENGINEERS

CHAPTER I

PROFESSIONAL PRESTIGE AND ENGLISH

The engineer finds English a necessary means for getting results in his profession. English, in fact, is the medium through which he practices his profession. It cannot be dispensed with in the day's work. The engineer unskilled in the use of English is handicapped in his professional progress and fails ever to gain prestige. Indeed, fifteen hundred practicing engineers, according to Dr. C. R. Mann of the Carnegie Foundation, state that bad English is responsible each year for more failures than inaccurate mathematical calculations. The far-sighted engineering student prepares for the time when he must make clear his professional ideas to his employer and to his clients, and when he must interpret his profession to the world. As a part of his engineering training, therefore, he includes an intensive study of English. It is essential to his success in engineering. In fact, though two men may possess an equal amount of technical information, the one who can use English accurately and effectively gains recognition where the one unskilled in the use of his mother tongue fails.

From the intensive study of English—that is, the study of the effective communication of ideas—the engineer can get two results:

1. He can get the power to present his professional ideas clearly and forcefully.
2. He can get the power to possess the thoughts of others that will benefit him in his "cultivation of human interests, human learning, human associations."

The engineer's failure in English seems to be due largely to the fact that he does not know how to use it to sell his professional ideas.

> If it is true that we [engineers] have something that the world needs and has failed to get, the fault is ours. We have not been good salesmen.[1]

Another engineer relates this incident and makes the following comment:

> I was in a large city, and an engineer skilled in his particular branch of the profession was scheduled to describe a highly interesting and unusual piece of engineering work to the public. The man evidently thoroughly understood his subject, but he presented it in such an unattractive way, seemingly without thought, preparation, or logical sequence, with little regard for choice of language or expression, that, in my judgment, the opportunity to inspire the public with respect and appreciation, not only of the particular project in hand, but of engineering in general, was lost.
>
> A salesman presenting his wares with no greater tact or preparation would make but few sales.[2]

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[1] Letter of Joel R. Belnap to Editor, *Mechanical Engineering*, vol. 43, no. 6, p. 412, June, 1921.

[2] Letter of J. M. Garrett to Editor, *Professional Engineer*, no. 5, p. 19, May, 1922.

The engineer's study of English, therefore, involves the consideration of the best methods for marketing his ideas.

In studying English, with a view to selling professional ideas, the engineer must have a thorough understanding of the three things that concern every salesman:

1. Knowledge of the product,
2. Knowledge of the market,
3. Knowledge of the individual customer.

Throughout the entire college course, the engineering student has been gaining a knowledge of his product—engineering fundamentals and technical information. After he has acquired a knowledge of his product, what material goes into it, how it is assembled, what its uses and its possibilities are, he is ready to put it upon the market. Unless, however, he has thorough familiarity with his product—accurate, definite technical information with sales value—he cannot concentrate upon his training in the technique of selling. It will be assumed, therefore, for this intensive study of English by the engineer, that he has his technical material well in hand, and is entirely satisfied with what he has to sell. His purpose in studying English is to get the methods of reaching the customer in the market.

> Imagination giving the power to see with remarkable clearness the customer of the market has been one of the qualities that the great builders and leaders of large industries in the United States have all possessed.[1]

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[1] Philip Cabot: The Engineer's Shortcomings as a Financial Manager. *Mechanical Engineering*, vol. 43, no. 12, p. 833. December, 1921.

The market for the engineer is to be found the world over, wherever there is need for

> the science of controlling the forces and utilizing the materials of nature for the benefit of man, and for the art of organizing and of directing human activities in connection therewith.[1]

The customer is the employer of engineers in the large industries, and the client, that individual or group of individuals who depends upon the engineer for expert knowledge and services. The talking points that the engineer skilled in salesmanship uses for these two customers, of course, differ because the purpose for which they want the engineer is unlike. One factor always affects the results which he gets from either of his customers—his English.

To the employer of engineers in the large industries, skill in English is one of the specifications for the employees; these employees are, in one way or another, to be salesmen whether they are in the sales department or in the factory.

> The graduates should be men who have been trained to think for themselves, have conservative judgment, but are not bound by precedent; who can be trusted to try out new and untried methods; men who can think straight and think through to conclusions; men who, having will for action, act promptly, effectively, and justly; men who quickly familiarize themselves with a situation, all its vital factors, and then form sound judgments which they have the ability to express so as to convince and stimulate.[2]

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[1] Federated American Engineering Societies Preamble.

[2] H. B. Shaw, describing the Henry L. Doherty specifications for technical graduates. *Mechanical Engineering*, vol. 43, no. 6, p. 421, June, 1921.

A recent engineering graduate, out of his experience in one of the large engineering companies, wrote back thus to his former college instructor:

> There is one thing that I would like to see impressed upon the students in engineering, and that is, that every engineering student should take advantage of all English courses which he can conveniently carry along with his regular engineering work. It would certainly be to his advantage. I find that in my work I would be better off if I had a better control of the English language. For letter-writing, it is of the greatest importance. I know, as a young graduate, that a student going through the engineering college does not think it of prime importance, and as one of the many who has found out, I should like to see that other student engineers do not make the same mistake.

To the client, English is not definitely a separate specification. Upon the effective use of English, however, depends the engineer's final success.

> Recently an engineer presented an important report to a city council. His report showed careful preparation, and he is a man of unquestioned ability. But his attitude was, "Facts, being established, leave no room for opinions, traditions, or fallacies." He knew they were facts, but the council did not. He took little pains to sell the facts to the council.[1]

For all his professional needs, those directly related to the practical presentation of his engineering projects and problems, and those directly concerned with his human associations, the engineer finds English indispensable. He needs it to maintain and capitalize his individuality. He needs it to assist him in developing his own judgment and in taking his own responsibility. He needs it to lift him out of his narrow technical field and make him versatile. He needs it to become a powerful executive, who can direct men, formulate policies, and win approval for his recommendations by the clearness, accuracy, and tact with which he conveys his thoughts to others.

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[1] Letter of Joel R. Belnap to Editor: *Mechanical Engineering*, vol. 43, no. 6, p. 413, June, 1921.

> The engineer has been accused of a lack of sociability, of shutting himself in with his own thoughts and problems and wonderings.
>
> If he lived more in the open, if he sought contact with his fellows, he would find them wrestling with the same problems and wondering and thinking about the same subjects. And they would be interested in his solution, his own thinking would be clarified by the process of expression, and he would find help and suggestion in their handling of their difficulties and inspiration in their discussion.[1]

To use English most effectively to meet all his professional needs, the engineer must know his product, his market, and his customer.

COLLATERAL READING

BAKER: "Engineering Education," pp. 45–64; pp. 75–92. John Wiley and Sons, 1919.

HAMMOND: "The Engineer," chap. VI, pp. 65–77. Charles Scribner's Sons, 1921.

"Language for Men of Affairs," vol. II, part I, chap. I, pp. 3–32; vol. I, part I, chap. II, pp. 20–41. The Ronald Press Company, 1920.

Engineering News-Record, vol. 90, no. 12, pp. 529–531, March 22, 1923.

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[1] F. R. Low: Go to Society Meeting. *Power*, vol. 55, no. 14, April 4, 1922.

CHAPTER II

RESOURCES FOR ENGLISH

The main problem that confronts the engineer in his study of English is how to adapt it to sell effectively his engineering ideas. Three distinct operations are involved:

1. A rapid survey of his professional equipment to discover the outstanding features that he can use as talking points for his product—that is, scientific training and his engineering aptitude.
2. An inquiry into the immediate and future market for his product. Of course, part of this inquiry was made when he decided upon his particular branch of engineering.
3. A study of the best method of reaching the customer in the market. It is in connection with discovering the most effective method of selling the product that English furnishes the means of getting his professional ideas to his customer.

English, therefore, as the engineer has need for it, is a tool, a useful instrument, a medium for transmitting thought. He must make it function equally well at low speed or high speed. He must handle it so skilfully, at all times and under all circumstances, that he can be reasonably sure of fashioning his thought with accuracy, brevity, and tact. The engineer who expects to succeed in his profession must keep these three qualities in mind and discover to what extent his study and practice have already given him power. He must determine how he can best increase his ability to express his ideas accurately, briefly, and tactfully.

The engineer's aim is to make his ideas so clear and accessible that others will be interested and give their cooperation to his plans and projects. The engineer inexperienced in writing is often at a loss to know what material in the way of ideas he has to develop. He recognizes, of course, immediately that all his resources in English are largely dependent upon his background; that is, whether he has heard good English all his life, whether he has been brought up among books, and whether he is ambitious. Yet a brief consideration of the resources for personal expression is advantageous.

There are only two resources: The first is *reading;* the second, *conversation.* They require only that the engineering student adapt the material that he comes upon daily as he pursues his technical study. He has to make only a cursory survey of his studies and of his college activities to discover how deep and rich they are. Take, for example, his reading of the publications of the professional societies. Licensing, ethics, politics, organization, social relations, as well as technical problems, will give the student engineer subject matter for his intensive study of English. Knowledge of these matters and insight into their significance are stirring the thought of practicing engineers. The reading of the technical periodicals, therefore, may be made a resource for English.

The engineering student, however, does not limit himself entirely to his technical magazine. He reads other magazines and, sometimes, books "to rest his mind." He reads what he chances upon, what some one has recommended, or what he searches out for himself. No one compels him to do this reading. He is his own master. No one holds him to account. In his general reading, whether he reads with discrimination or without, he unconsciously and involuntarily gets tricks of presentation, words, outlook, and ideas. When he begins an intensive study of English, this general reading is a resource.

Conversation, or talk, is the second great resource for personal and individual expression. It is the democratic exchange of ideas with equals, inferiors and superiors upon the same subject, and upon different subjects. The student who will experiment with conversation as a means of getting many points of view will gain valuable results. He has only to note the products of a conversation on college education with a self-made man, or on economic conditions with the worker in the industries, to see the range of possibilities from talk.[1]

Conversation also affords the student an opportunity to clarify his own ideas, to see their effect upon others, and to test out their soundness. Talk is not confined to any one place, to any one occasion, nor to any one person. At any time and anywhere, the engineer may have the adventure and the stimulation that conversation can bring. Indeed, his spoken English is often as influential in advancing him professionally as his written English.

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[1] Read C. R. Walker, Jr.: "Steel," Atlantic Monthly Press, Inc., 1922.

Ideas from his reading and ideas from his conversation are the raw products from the two great and ever-renewable resources which the engineer has for his mature study of English. An inventory will disclose to him just how much he has begun to draw upon them.

In competition with men preparing for other professions, the engineering student often feels that he lacks facility in expressing himself. He realizes for the first time probably that his engineering studies have had a tendency to develop a code for transmitting technical ideas and that the code limits the number who can understand. It compresses much in little space. The explanation of any simple working formula in engineering to a non-technical person will indicate to the engineer what high compression there is in even the simplest technical discussion which is in the code. As a result, the reason for the engineer's impoverished vocabulary and his meager discussion of ideas that do not demand the technical code for transmission is evident. This intensive study in the code has a bearing, also, on the explanation of the handicap of which he is conscious when he attempts to explain his plans and projects to non-technical men, and to enter into extended discussion of general topics with other men. To overcome this weakness and this handicap, practicing engineers are now insisting that engineering students have *more English*—all that it is possible to take in connection with the regular engineering course.

COLLATERAL READING

HILAIRE BELLOC: Lucidity, *Literary Review,* vol. 3, no. 32, pp. 597–598, April 14, 1921.

E. P. MATHEWSON: Training of Engineering Students, *Mining and Metallurgy,* vol. 4, no. 193, pp. 9–10, Jan., 1923.

ROBERT LOUIS STEVENSON: "Talk,and Talkers," part I, pp. 135–157, Charles Scribner's Sons 1910.

"Language for Men of Affairs," vol. I, part IV, chap. xiv, pp. 285–303, The Ronald Press Company, 1920.

CHAPTER III

PRELIMINARY ANALYSIS

The engineer's purpose, therefore, in his study of English, must be to extend his range of expression beyond the limits of the technical code. He must, first of all, sincerely have something to say.[1] The engineer, perhaps, does not offend so often by idle verbosity as do some others. "He usually," as a practicing engineer recently remarked, "lets his pen lie idle until he thinks he has something to say." Nevertheless, even the engineer will profit by assuring himself that his idea is forcing expression.

To determine what there is to be said requires careful preliminary analysis. This preliminary analysis serves the same purpose for the speaker or writer that the preliminary mine survey does for the mining engineer. He goes over the whole problem before he makes his decision. He studies location, supply and demand, and the possible dividends; then he makes his recommendations. The technical man should give his ideas the same careful scrutiny and study before he gives them voice.

A recent editorial in one of the technical periodicals has some very interesting comment to make upon talking to the point:

> The genus time-waster includes several species. There is, for example, the chap who cannot stick to the point and

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[1] See *Mailbag*, vol. 6, no. 9, p. 265; p. 297.

wanders off into byways that to him may be most interesting but that contribute nothing to the subject at hand.

. . . . . .

Much of the rambling—most of it, probably—results from a lack of clear-cut purpose in the speaker. Many do not prepare in advance, even in their minds, what they propose to contribute to the discussion. Sometimes, of course, ideas are suggested by what another has said; but it would seem from the very nature of such cases that the comment would be to the point. Digression of this sort is in general unconscious and can be easily eliminated if speakers will formulate clearly in their minds just what they want to say, get up and say it, and, when they have said it, sit down. It takes a good man to know how to talk; it takes a better one to know when to stop.

. . . . . .

We believe that if conciseness were more generally in vogue in technical discussions and loquacity were more openly frowned on as being decidedly unsportsmanlike and in bad form, many of these younger men and more modest—and often more competent—men would be encouraged to say their say.[1]

Laboratory methods may be applied in testing for ideas as well as in testing for chemical compounds. Numerous examples might be cited to demonstrate how much work is done in the mental laboratory before any results are made public. Most students, however, want the rough draft which results from the preliminary survey to present the thought effectively. Rough drafts are not safe until the student has gained the power to analyze accurately for the best use of the material. Even then, careful revision is profitable.

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[1] Why Engineers Stay Home. *Engineering News-Record*, vol. 88, no. 24, p. 981, June 15, 1922.

Effective writing is frequently a difficult and an unsuccessful process, especially if thinking follows rather than precedes writing. The outside reaction from the written presentation of ideas cannot be immediate. A student may bungle along in speech and find his way as others indicate to him their immediate reaction. Other means are necessary to check the written presentation. The almost sure indication of vagueness—lack of ownership of ideas—is the very fact that presentation seems to involve so much physical labor. Physical effort, of course, must be expended in expressing definite ideas. Without definite ideas, however, the physical effort is more than doubled. The engineer should test, first, for the definiteness of his thought. He must find out whether he *owns* the ideas.

This searching preliminary analysis, before he has gained skill through practice, will, of course, slow down action. The confidence gained, however, from making sure of ideas, more than pays for any temporary cutting down of speed. The faith that results from accurate analysis will aid the engineer in imparting his confidence to others. Men speak with conviction about those things which they have determined for themselves.

As soon as the engineer has ideas in which he has faith, he has his working material in English, to be modified and adapted to suit his many purposes. English, rightly considered, is as definite as any of the tangible materials involved in engineering and can be handled in the same way as the others. The engineer, therefore, at the beginning of his intensive study of English must discover means for making English definite. His next step is to work out a method of getting a detached and impersonal attitude toward his own ideas. Finally, he recognizes the fact that, since two-thirds of the time his reader is the non-technical man, he must express his ideas in simple, clear, and accurate terms.

A good standard for the engineer to keep before him in his study of English is that set forth by the Director of the American Chemical Society News Service bulletins:

> Their object was to prevent technical errors from creeping into the daily press by so presenting essential facts that they could be assimilated quickly by the busy journalist. They served frequently as the basis for feature articles which had not only the entertaining style and breadth of view which the experienced newspaper man can so admirably give, but they retained that precision of statement considered so essential by men of special scientific training.
>
> The bulletins themselves are written by experts in the lines treated and they have been edited with the utmost care.[1]

All that the engineer writes should have the same aims: (1) Essential facts, (2) precision of statement, (3) careful editing.

Evidence of these aims is apparent in the editorials of any of the technical magazines. They are clear to others besides the technical reader. Indeed, the words chosen, and the organization, do not belong solely to the engineering profession or indicate only technical interests. The editorial writer usually selects words that all can understand. He indicates his technical leaning by the interpretation which he gives scientific facts, and by his point of view. English for engineers, or "*engineering English*" as it is popularly called, therefore should mean the presentation of ideas from the engineer's angle, the interpretation of ideas as he sees them with his interest, his training, his ambition, and his vision.

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[1] Letter to the MANAGING EDITOR, by CHARLES H. HERTY. Director A. C. S. News Service, Jan. 9, 1919.

COLLATERAL READING

AYDELOTTE: "English and Engineering," pp. 1–3; pp. 28–44. McGraw-Hill Book Company, 2nd ed., 1923.

EARLE: "The Theory and Practice of Technical Writing," chap XII, p. 235. The Macmillan Company, 1920.

HALL: "Handbook of Business Correspondence," sec. II. pp. 57–59. McGraw-Hill Book Company, 1923.

CHAPTER IV

THE MECHANICS OF EXPRESSION

The general problems of English which the engineer has to solve are largely those which every professional man must master:

1. He must know his natural and available resources for effective communication.
2. He must find time to increase his natural resources.
3. He must get the right attitude toward English.
4. He must be accurate in the mechanics of language.
5. He must subordinate the mechanics to the qualities that make for effective communication.
6. He must find time for actual practice in effective writing.

The engineer ought to be able to assume that his grammar is correct, that his spelling is accurate, and that his sentences are complete. Errors in the technique of expression have a tendency to discredit the person or the company that permits written material to go out that is not letter perfect, or that sends out representatives who seem by their speech to be illiterate. In connection with the influence of accurate English upon the customer or the client, a comment in a recent number of *Associated Advertising* is significant:

In our advertising copy and sales letters we are writing to two classes of people. There are people who neither know nor care whether our English is correct. There are others who do. The former class will not be offended by correct English. The latter will think of the English rather than the thing advertised, if we slip a cog. We are advertising to all people. Therefore, it behooves us to write and punctuate correctly.[1]

Practicing engineers as well as experienced business men have found out through the trial-and-error system the significance of knowing for themselves the grammatical essentials. They have discovered how their confidence in their own English has been increased by this knowledge Men without confidence in their power to use accurately the mechanics of language feel their inferiority and their handicap. Such men, when called upon to present their technical ideas to their superiors, are inarticulate.

Some of the books that make easily accessible the standard practice in the mechanics of expression are:

WOOLLEY: "Handbook of Composition." D. C. Heath and Company.

GREEVER and JONES: "The Century Handbook of Writing." The Century Company.

PENCE: "The Mechanics of Writing." The Macmillan Company.

HOTCHKISS and KILDUFF: "Handbook of Business English." Harper and Brothers.

RICKARD: "Technical Writing." John Wiley and Sons.

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[1] Making English Ring the Bell, C. H., *Associated Advertising*, vol. 12, no. 10, p. 16, October, 1921.

In addition to these handbooks, every engineering student should be thoroughly familiar with the style books or directions for authors, issued or approved by his particular professional society. These style books have codified the best of present-day practice in the mechanics of English, so that it can be readily adapted to the particular needs of writers on technical subjects.[1] The handbooks include wider and more general usage.

English, as the engineer has need for it, must have clearness, conciseness, and emphasis. The most important quality is *clearness.* This means watertight, accurate presentation of ideas in which there are definiteness and exactness. In the constant aim and insistence upon clearness consists the engineer's factor of safety in English. His ideas are subjected to varying stresses because they are used by people with many interests and different needs; hence his ideas must be sound, and the English structure which he raises to bridge the space between his mind and that of his reader must be safe.

The elastic limits of a technical writer's thoughts are well worth the attention of the future engineer. Testing work in the materials of English, as well as in reinforced concrete, pays. The accurate and skilful assembling of an engine from the best possible materials brings financial returns. The organization of ideas which demonstrates competency and carries conviction also brings profit. The same laws of procedure apply and the same standards of workmanship are needed for both—accuracy, reliability, judgment, sincerity, and enthusiasm.

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[1] Some of the professional societies which have style books or directions to authors are: The American Society of Mechanical Engineers, the American Institute of Electrical Engineers, the Society of Illuminating Engineers. The style sheets are sometimes sent free of charge to members; sometimes they are sold for a small sum. Through the student branch of the particular society, the student can get exact information about these sheets.

The next quality is *conciseness.* Every single word should be productive to the highest degree. The insistence upon this quality, however, need not make for abruptness, discourtesy, or vagueness. This insistence means the close scrutiny of every single word to make sure of its accuracy, appropriateness, and range. Conciseness does not necessarily cut down the number of words used in a sentence, a paragraph, an article. Conciseness is based upon the selection of enough words to express adequately and clearly the underlying idea. Conciseness means skill, competency, and intelligent and comprehensive understanding of the idea upon the part of the writer.

The third quality is *emphasis.* Unemphatic arrangement of words and phrases by the engineer very often is the most pronounced weakness in an otherwise acceptable piece of writing. It is remarkable how so slight a change in a sentence as the order of a word or a phrase will frequently not only clear up ambiguity, but will also give the required stress and immeasurably increase the value of the whole. The inexperienced writer will profit by trying the effect of simply rearranging parts of sentences in his laboratory reports. He will be amazed at the results which come from only slight readjustments. Such practice, also, furnishes a very interesting means of developing his power of judgment and of rating his own work for himself. Emphasis means getting the important words and phrases in strategic positions in the sentence. These positions are either at the beginning or the end of the sentence. Emphasis may be considered for larger units than the sentence, but the engineer has most need for it in making effective sentences.[1]

The engineer, of course, can practice his profession without any of the refinements of language or accuracy in the fundamentals of the mechanics. A man's language, however, is taken by most to indicate not only his literacy but also his background, the grade of society in which he has placed himself, his tastes, his aspirations, his diligence, and his appreciation. A man should use the kind of language that suits him best. The only points to bear in mind are that he is judged by his language, and that he must be willing to accept the rating of himself that he has made. It is absurd, of course, to overstress the formulas of language or those of engineering.[2] Discretion, a sense of fitness, and common sense must be applied to both. But the formulas of language should not be overlooked any more than the formulas of science that underlie the engineering profession. Accuracy in both is essential. Consistency should make the engineer accurate in the mechanics of both.

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[1] Any good book on rhetoric will give the interested student extended discussion of these three qualities.

[2] The engineer will probably sympathize with Henry Ward Beecher's attitude. (See GEORGE HERBERT PALMER: "Self-Cultivation in English.") Once, when a student told him that he had made a mistake in grammar in one of his sermons, Beecher replied, "Young man, when the English language gets in my way, it doesn't stand a chance." That is, Beecher did not allow the formulas of language to cramp his expression. He kept his attention centered upon the idea. He did not, however, offer this comment to explain any but occasional slips.

Before the matter is too vital professionally, he may test out his ability and work out a method. This method will give him superior technique later on when promotion or position may depend upon his facility to use English. Through participation in the activities of the student branch of his professional society, through contributions to his professional college magazine, through all the channels in college for self-improvement, he may gain power in English.

COLLATERAL READING

HALL: "Handbook of Business Correspondence," sect. XXX, pp. 1003–1006. McGraw Hill Book Company, 1923.

PALMER: "Self-Cultivation in English." Houghton Mifflin Company.

SYPHERD: "Handbook of English for Engineers," pp. 11–25. Scott Foresman and Company, 1916.

Associated Advertising, vol. 13, no. 9, p. 28, September, 1922.

CHAPTER V

BUSINESS LETTERS FOR THE ENGINEER

The engineering student studies the business communication: (1) That he may be able to write a result-getting letter; (2) that he may be competent to judge, with a reasonable degree of accuracy, the letters which he is bound to receive in the course of his professional practice.

Generally speaking, the business letter has three aims: (1) To record a transaction; (2) to accomplish a specific purpose; (3) to create good will for the firm represented by the writer. Well-written business letters can have all the advantages that are expected of the personal representative, except, of course, the living presence. They cost less, and they can reach the reader or prospect more frequently than is physically possible for the traveling representative.

If the modern business letter were only a record of business transacted or about to be transacted, there would be little value in studying it as one of the effective means for the communication of ideas. It would be better studied under recording and filing. The stereotyped acknowledgment, which the best practice is getting away from, "Yours of the fifteenth instant received and contents noted," is a hold-over from the first use of the business letter, as a record. Business still needs the record in the letter, but the record now usually gets secondary stress. The tone is much more desirable if the letter brings in the records in some such fashion as this:

> We are glad to learn from your letter of October 15 that you have received the catalogue of our conveyor belt which we sent you October 12.

The writer of business letters expects to handle adequately the underlying situation and to effect a definite result from every letter which he writes. The modern business letter is now greatly concerned with the matter of creating good will and of selling service first[1] and goods afterward.

> In these days good will is regarded as property. Good will created through advertising is a known, bankable quantity. Manufacturers know what it costs and is worth, because they pay for it and see results in increased profits.[2]

People everywhere respond to consideration which is shown them individually. It is amazing sometimes to what trouble and expense firms go to satisfy the client, or even the casual inquirer. The feeling, however, prevails that courtesy and service that bring good will are always profitable.

To convey successfully and sincerely to the addressee this offer of service in a letter is a matter of high-powered English. Since the addressee is influenced by seemingly insignificant things, the writer of business letters has to strengthen his letter in all possible ways; the letter, therefore, must conform in every way to good taste, both in the external appearance and in the presentation of the message itself.

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[1] John Van Brunt: Service, from the Standpoint of the Stoker Manufacturer. *Combustion*, pp. 118–120, September, 1921.

[2] Editorial, *Associated Advertising*, vol. 13, no. 8, p. 18, August, 1922.

Both these problems merit some extended study and will be taken up in some detail a little further on.

The second reason for the engineer's study of the business letter is that he may be able to estimate men. Much of the engineer's success depends upon his knowledge of men and his ability to handle them. He needs to use every available means to increase his ability to rate them and their projects through their business communications. The business letter gives him one more means of passing judgment upon the personality of the writer, and the policy and methods of the business which is represented. The business letter, as much as the personal, friendly letter, is an expression of character. Indeed, the best business letter has something of the directness and individuality of a good friendly letter. The stationery upon which it is written, the letterhead, the layout of the message on the page, and the display, as well as the actual message, indicate the degree of alertness, the progressiveness, the vision, and unity of the business house, and the personality of the writer.

One must be an expert, of course, to be able to tell with any degree of exactness the financial standing and the business conditions within a company through the letters that are sent as its personal representatives. Yet, with only a general knowledge of the requirements, purpose and practices of the best business concerns, one can rate, in a general way, the reliability of the firm and get back of the message to the business itself. For instance, with only a slight knowledge of practice, one can judge the age or condition of the company that might put its sales message upon cheap paper, crowd the message on one page, and then enclose it with the sales letter of another concern. It is just being established, is on the border of bankruptcy, or is poorly managed, at least in the sales department. The article might be worth buying, but the external evidence in the letter would be entirely against a favorable reception of the project; in fact, the evidence is likely to call the whole proposition into question.

On the other hand, it is not easy to judge from the external appearance of the sales letter of unreliable promoters, that unsafe investments are being offered. The stationery is usually good, the display is pleasing, and the layout attractive. One has to be able to see beyond these things to the ambiguities of these form letters. "We are making this offer to a very limited number of whom you are one" cannot always be taken at its face value. The reader should investigate a little the rating of any company which makes such an offer before he decides to invest his money. The best business houses, it is true, because of the cost of even the letter, do send out their sales letters often to a hand-picked list. But they do not often tell the reader that. They spend their time and effort rather in working out the kind of letter that will appeal to the direct interests and needs of the individual prospect. These firms have found that it pays to concentrate in the message on talking points of the commodity.

The engineer is not, however, always so situated that he can get the benefit of an expert's judgment upon the relation of style to the reliability of the message. He is exceedingly vulnerable to smooth and skilful presentation of propositions. If the writing is not strictly technical, he is often thrown off his guard by careful choice of colorful, figurative words; by the writer's power in handling sentences, his stress, his skill in the technique of writing. The engineer is likely to think that, because an idea is smoothly and emphatically presented, it ought necessarily to follow that the idea will stand the acid test. Hence, he is a prey of writers of plausible but unreliable letters on all sorts of subjects.

The engineer should transfer to his study of business letters the same critical power of analysis and accurate judgment that he applies to what he considers his fundamental professional subjects. He should construct the presentation of his ideas carefully and permanently. He must demand the same careful and permanent construction of ideas by others that he expects of himself and others in the making of an engineering structure—a bridge, a machine, a building, a ship. Though not so apparent and often not so swift-acting, the results of unreliability and of failure in English are as far-reaching, as definite, and as final. They discredit the builder as seriously as if his bridge had fallen or his building had collapsed. From a study of business letters, the engineering student, therefore, ought to expect to gain the fundamentals of accurate judgment on the written presentation of ideas. He needs to be able to distinguish between exact and ambiguous presentation. He must be competent to decide from his own knowledge when the written presentation is an offer of fair, honest and lasting returns for energy and money invested.

The engineer will find a very interesting and profitable study in the close scrutiny of all the business letters that come to his notice. At least, before he throws them into the waste-basket, he should give them a cursory reading. There is much to be learned concerning policies, approach, and display from any mailing piece. One very well-known inventor has remarked that he makes it a point to look over all written material that comes to his desk every day. Otherwise, he is afraid that he will miss something of value to him.

For the engineering student, making a collection of letters is as good a pastime or hobby as collecting stamps, and as profitable. He need not make this collecting a burden, nor clutter up his files with useless letters. If he is to profit, however, he must collect long enough to be able to make a somewhat extensive survey, from which he may summarize and generalize with a fair degree of accuracy. It is interesting, also, to learn just what type of letter the engineering student is likely to receive. In addition to discovering what firms have him on their list of prospects, he will find out what is the usual method of approach, the general tone of the letter, the talking points which are evidently thought to have a special appeal for the technical man, and the method of clinching the proposition. Even while an undergraduate, an engineer can gain much information about the business with which he later is likely to come in contact.

Business letters are used to handle practically every situation which may arise in selling and in dealing with people. They are used for ordering, for crediting, for adjusting misunderstandings and differences, for selling, for collecting accounts—in fact, for all business transactions.[1] All of the types are not equally important to the engineer. With the exception perhaps of the letter of application, the types of business letter for which the engineer has most use are those with the executive tone; that is, those in which, as a leader, the engineer with the training, experience and responsibility plans and directs the actions of others, sets the standards, and accomplishes the policies of his organization.

Of course, the young engineer seldom becomes an executive immediately after completing his formal technical training. Wisely, he must serve a long and often severe apprenticeship to get some insight into the types of communication that the man at the executive desk needs if he is to remain in his position and to progress as his experience increases and his judgment becomes more reliable. These executive letters for the engineer—that is, those letters by means of which he expects to accomplish his purposes—are the order letter, the letter of inquiry, and the letter of instruction. The sales letter is included among the letters that an engineer needs to know because upon his insight into the general purpose, make-up and handling of sales by letter depends the reliability of his judgment upon the many sales letters which will come to him. All these various types of letters, for which the engineer has need, will aid him in getting his ideas to the market and to the customer.

Of course, when he writes under the direction of the company with which he is connected, he will have to follow its general practice. Sometimes he may not agree with it, but until he has had enough practice to be authoritative, it is inadvisable to suggest too many innovations or changes in the correspondence policy. While methods may seem antiquated and ultra-conservative, there are probably reasons. The most progressive concerns, however, generally have a definite and satisfactory correspondence policy. The inexperienced engineer will profit by any opportunity which he may have to get actual correspondence practice.

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[1] A good book on general business correspondence is HOTCHKISS and KILDUFF: "Advanced Business Correspondence," Harper and Brothers, 1921.

COLLATERAL READING

T. A. CLARK: "When You Write a Letter." Benj. H. Sanborn and Company, 1922.

SAUNDERS and CREEK: "Literature of Business," pp. 269–274; pp. 328–334; pp. 352–359. Harper and Brothers, 1920.

"Language for Men of Affairs," vol. II, chap. XI, pp. 185–197; chap. XII, pp. 198–209. The Ronald Press Company, 1920.

CHAPTER VI

MECHANICAL PROBLEMS OF PRESENTATION

Without reading into a letter, but from observing the general display and layout, the reader can draw certain definite conclusions which hold, to some extent, for the message itself. Display and layout have the same relation to "selling" the message of the letter that window decorating and showcase arrangement have to selling the manufacturer's product. Display is the typographical arrangement of the various parts of the letter—the letterhead, the inside address, the salutation, the message, the complimentary close, the signature—for the emphasis of these various parts. Layout is the typographical arrangement of the whole letter on the page that fits the display of the various parts into a unified design. Layout makes the message attractive, accessible and emphatic. Display and layout should always be appropriate to the message and should conform to the standards of good taste.

Good display and layout alone cannot carry the whole responsibility of getting the writer's idea to the reader's mind and of stimulating action. Good display and layout, however, can go a long way toward increasing the effectiveness of the presentation of the fundamental idea. When good display and layout are used to call attention to good material, good workmanship, and honest purpose, they are a means of selling the product, whatever it is. The display and the layout of the written message are indicative, too, of the personality and character not only of the business but also of the correspondent.

Well-established and well-managed businesses have generally unified and standardized their correspondence practice and have decided upon paper and envelopes, as well as upon arrangement and typing, with a view to giving the addressee at once some impression of the business.[1] Before he reads the message, he gets from the quality of the paper, the letterhead, the mechanical arrangement of the message on the page, a very definite, general impression of the business and its stability. Appearances, of course, are not conclusive evidence. Get-rich-quick schemes are often presented after the manner of conservative business proposals.

As a guide to what the reader is likely to find in the message itself, however, the external appearance of a letter is significant, even though it may not be final. Knowledge of the relation of the appearance to the message will give the engineer some standards for judgment. Just as dress characterizes the individual, so display, layout, and the other physical features of the letter have a very definite relation to personality and character.

If the busy correspondent were to analyze his reasons for sorting his letters, and for making snap judgments upon them from their external appearance, he would mention certain definite things. The first, perhaps, would be the quality of the paper. A good quality of paper should always be selected. It does not pay to economize here. White is always a safe choice of color, though gray, buff and some of the other inconspicuous colors are sometimes used for individual reasons—to identify, to particularize, to give distinction. But white stock simplifies the choice of typewriter ribbons. If the writer uses a colored stock, he should always select a typewriter ribbon that will harmonize. Green stock with a purple ribbon, for instance, reflects unfavorably upon the internal handling of the business or upon the person using this combination. This unfavorable impression comes in spite of the fact that the combination may be due to lack of taste or the failure to attach sufficient importance to the minor things rather than to any inherent unreliability of the company or of the person using them. The engineer has only to study letters with this idea in mind and to check his reactions in order to realize how forceful this impression is.

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[1] In connection with this thought on getting an impression of a business through external appearances, the architect's planning of a bank building to give the impression of stability and safety is a very interesting example.

Since the engineer's correspondence is largely with business men who are likely to use standardized filing systems, he will find it convenient to adopt for his letters the unruled, standard-sized sheet of paper, 8½ by 11 inches. Smaller sheets than this, while sometimes used, generally are not desirable. Because they are small, they are often misplaced and overlooked, if not actually lost in the files. This possibility is avoided in some offices by the practice of attaching these small sheets to standard-sized ones before they are put into the files. But such practice is slow and expensive, and, other things being equal, the person who writes his letter upon a small-sized sheet runs the risk of having his letter mislaid, overlooked, or at least often delayed in handling.

The envelope selected should be in accord with the paper in color and texture. The standard size is 6½ by 3⅝ inches, though there is not the need here for such strict conformity to standardization as there is for the correspondence sheet. Envelopes are usually not filed. Unless there are very special reasons, envelopes in large concerns never come to the attention of the correspondent or the executive. They are opened at a general desk, and the letter is taken out. Some people make a practice of using a 4¼ by 9½ inch envelope to individualize and to avoid so much folding of the sheet. If the sheet is to be filed, as it generally is, the more unwrinkled the sheet is the more convenient it is for the files. The individual, however, can make his own choice for his letters. This will be determined by his judgment as to what effect the size of envelope will have upon the addressee and how it will aid the presentation of the message.

Since the 4¼ by 9½ inch envelope has not extended use, the engineer who wishes his letter to receive special attention, and who expects to have it reach the addressee unopened, can increase the attention-getting qualities by using this sized envelope, and by writing *Personal* on the lower left-hand corner of the face of the envelope. These devices for individualizing the letter should, however, be used with discretion. The writer should be sure always that his message merits them. The reason for individualizing is a need for introducing the writer to a particular addressee. When the writer is sure that these methods are an aid to conveying the impression of individuality, and will not suggest eccentricity, cheapness, and sensationalism, they can be used advantageously. The purpose is to get self-respecting and self-reliant personality into the written conference. All the means that may be made to contribute to this end are worth while.

The letterhead of a business letter is for the purpose of identifying the particular firm and of giving the recipient of the letter the information he needs concerning the exact name of the firm and the address. It bears the same relation to the sheet that the return address does to the envelope. It is not to give the history of the company or a long tabulated list of its products or activities. If a special appeal to the interests of the particular addressee seems desirable, it is well for the firm to classify its products, and have a letterhead for the particular group of addressees. One engineering concern which manufactures several kinds of machinery has used different types of letterheads very successfully. The letterhead should always be plain, simple, conservative, and in good taste.

Paper manufacturers often get out booklets of sample letterheads on their different stocks of paper for advertising purposes. The engineer who wishes to get suggestions for his own business-letter stationery should provide himself with these pamphlets of the most reliable paper manufacturers. Sometimes this advertising material is sent for the asking. Sometimes there is a slight charge. But, either way, it is worth having.

The letterhead should not, except in the case of an old-established firm where the letterhead has all the value of a trademark, present cuts of old photographs. While these old photographs may suggest an old and experienced company, there is also the suggestion of ultra-conservatism, especially if styles have changed notably since the time of the original photograph. For instance, it is not often that the observer attaches the intended significance to the letterhead in which horse-drawn vehicles are seen on the streets surrounding the plant in 1880. If any appeal is made, it is probably only that times have changed and that it is out of date. Another objection to this type of letterhead is that it takes up too much space on the page, and hence gets too much prominence.

Even for the firm that deals in notions, it seldom seems advisable to list in the letterhead, as a part of it, all the various commodities which the firm offers. The law of attention should make for the emphasis of only a few leaders if it is necessary to mention any. Long lists, also, printed down the margin on either side of the written message, tend to enclose it and bury it instead of giving it prominence. The same result comes from lists in the letterhead. Emphasis is lost. Sometimes it seems desirable to include, as a part of the letterhead, the names of the officers of a company for the purposes of identification. Again, if a company has branch offices, the general letterhead of the company is used with the name of the local city inserted in the proper place in a different color to call attention to the fact that it has not come from the main office.

> There is a growing tendency to consider letter headings as dignified business cards rather than hand-bill advertisements.[1]

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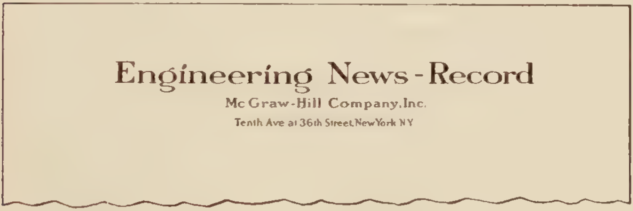
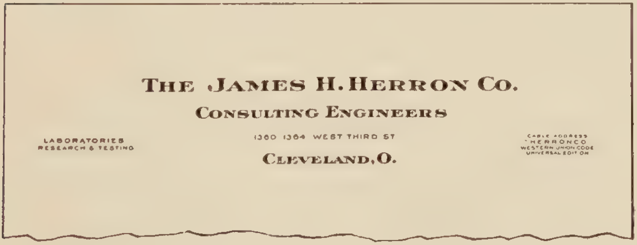
[1] Henry Lewis Johnson: "Parsons Handbook of Letter Headings." Parsons Paper Company, 1915.

The best type of letterhead gives the name of the firm, the address, the telephone number, if there is a good deal of local correspondence, and the cable code if the firm does international business. This letterhead should generally be in plain, inconspicuous color, in keeping with the color of the paper used.

The following are samples of the dignified, conservative letterhead:



Engineering News-Record
McGraw-Hill Company, Inc.
Tenth Ave at 36th Street, New York N Y



THE JAMES H. HERRON CO.
CONSULTING ENGINEERS
LABORATORIES
RESEARCH & TESTING
1360 1364 WEST THIRD ST
CLEVELAND, O.
CABLE ADDRESS
"HERRONCO"
WESTERN UNION CODE
UNIVERSAL EDITION

Both of these indicate very well the purpose of the letterhead as a "dignified business card." Many others equally good have not been included, because of lack of space. Here again it is well to consider the color of typewriter ribbon. The color of the letterhead and the type in the body of the letter should harmonize. With blue in the letterhead, the typist should use a blue ribbon; with black, black;

never purple with black or green. This conformity does not apply, however, to the sales letter.

The date should not be included in the letterhead. The expense for printing is increased, because of the changing months. Aside from the need for frequent printing of stock, and the added details of sorting in the stockroom, it is extremely difficult for the typist to place the date exactly in the limited space indicated. The initial impression that the reader gets, consciously or unconsciously, when he opens a letter in which the date is out of alignment is, to say the least, unfavorable. It is more economical in every particular for the typist to take time to type in the date than it is for her to try to fit it into a definitely specified space.

In conclusion, it is well to note that the engineer will come across all kinds of letterheads—almost as many types as there are businesses. In fact, there often seems to be an almost direct relation between the particular business and the letterhead. Perhaps it would not be going too far, however, to say that the letterhead is indicative of the general policy of the firm—conservative, progressive, sensational, systematic. At least, the letterhead, like the quality of the paper, the size of the sheet, the display, and the layout, is indicative of the methods of the correspondence division of a firm if not of its business principles. When the engineer selects a letterhead for himself, he should keep in mind the fact that it, like every other part of the business letter, gives an impression of him. He should plan to have it contain the kind of information that will make the letter mean something to the particular addressee. Yet, it is not enough for the engineer to know how to select one for his own business. When he studies the letterheads of the letters which he receives, he ought to have sufficient understanding of the real use of the letterhead to get from what he has before him some knowledge of the company. The letterhead may be a means of adding to the details whereby he sifts the false from the true.

Another matter, which has a bearing upon the appearance of the letter, and which is indicative of the amount of planning the letter-writer does and his regard for a definite correspondence policy, is the actual arrangement of various formal divisions of the letter on the page. Under this head are included width of margins, abbreviations, spacing between paragraphs, punctuation, and the position of heading, inside address, etc.

The mechanical arrangement of the message on the sheet is a matter that may be standardized for margins, writing of date, spacing, inside address, punctuation of inside address, of the salutation and of the complimentary close, paragraphing and typing in the signature just below the pen-written signature to make sure that there will be no difficulty in deciphering it accurately. The specimen letters that follow show the two most common practices in the mechanical make-up of the business letter. These letters are not offered as models, but as illustrations of the two most frequently followed forms:

47 West Fourth Avenue,
Columbus, Ohio,
June 15, 1922.

Professor R. L. Smith,
Ohio State University
Columbus, Ohio.

Dear Professor Smith:

I am returning herewith, in compliance with your request, a copy of the introduction to our thesis, as I handed it to you some weeks ago for correction. I hope that the paper may prove interesting, and useful, too.

The finished introduction was similar to the longer version enclosed, with several changes, omissions, and additions. The introduction was followed by numerous tables of data and results, with detailed explanations, and by curve sheets and photographs. The whole made a very good-looking paper.

Your assistance with the written matter was truly appreciated. We take this opportunity to express our thanks.

Very truly yours,

A. T. Jones

Exhibit A

47 West Fourth Avenue
Columbus, Ohio
June 15, 1922

Professor R. L. Smith
Ohio State University
Columbus, Ohio

Dear Professor Smith

I am returning herewith, in compliance with your request, a copy of the introduction to our thesis, as I handed it to you some weeks ago for correction. I hope that the paper may prove interesting, and useful, too.

The finished introduction was similar to the longer version enclosed, with several changes, omissions, and additions. The introduction was followed by numerous tables of data and results, with detailed explanations, and by curve sheets and photographs. The whole made a very good-looking paper.

Your assistance with the written matter was truly appreciated. We take this opportunity to express our thanks.

Very truly yours

A. T. Jones

EXHIBIT B

Both of these forms are acceptable and both are widely used. Exhibit A represents the conservative practice, and Exhibit B, a modern one, brought about, no doubt, through necessity where a large number of letters must be handled daily. For it is, of course, apparent that every extra mark of punctuation means an extra stroke on the typewriter. While this additional effort is insignificant if only a few letters are to be written, for many letters these extra strokes in the course of a day will probably amount in effort to almost enough for another letter.

Again, some of the punctuation marks—the period after the year of the date in the heading and the comma at the end of lines in the inside address—are purely matters of convention. They do not aid in the clearness of the message. Their original significance has been quite lost. But whether one uses them or does not use them is not a vital matter. Conventions have their place. The accessibility of the message is by no means affected whether these conventional punctuation marks are used or not. Similarly, clearness is not affected whether the writer selects the indented system of paragraphing (See "A") or the block system (See "B"). Either is clear.

The argument for the block is that it is easier to begin each paragraph flush with the margin and leave two spaces between paragraphs than it is to set the carriage of the typewriter over ten spaces for each new paragraph. The present practice, it will be observed by a study of actual business letters, is usually a compromise between "A" and "B." In the inside address, the block system is used; in the paragraphs there is indentation and between paragraphs one space is left. One may use his own preference as to what plan he will adopt. The only essential is that he be consistent in his practice.

Sometimes unusual methods of display are used by individual writers. In these they are influenced by their own personal attitude and by their feeling that the message will gain prominence by unconventional display. For instance, the date is sometimes put in the middle of the page, under the letterhead, instead of at the right, and written out. There are other individual practices, which the student will observe from time to time in the business letters that come to his attention. These are, of course, permissible, for they are used, though not extensively. The engineer will do well, until he is firmly established in his profession, to be conservative in these matters. It is not wise to carry the matter of individualism too far. It is not safe until he has a good sense of relative values, so that he will break conventions wisely, not blindly and indiscreetly. Eccentricity is never desirable. Individualism, is, however, when it represents strength that comes from vision and judgment.

It is wise, also, to be conservative in spelling. While simplified spelling is used by some business men, it is not yet in general enough use for any young writer—unless he knows the attitude of the man to whom he is writing—to risk an unfavorable reaction to his letters in a matter which he can, with only slight effort, avoid. The conservative spelling of words will not offend; the simplified may. For the reaction that it is likely to bring, inaccurate spelling also should be eliminated. It should be a matter of pride, not of penalty, for a man to have the words of his message correctly spelled. It is a part of his craftsmanship in the art of effective communication of ideas.

There are several other small matters which ought to be mentioned here in connection with mechanical form. The inside address should be written accurately, both as to the name of the company and to street, or street number, and city. The writer should be as painstaking in this matter as he is in insisting that his own name and address be written accurately. It is not only a matter of courtesy, but also a matter of business. Mail is frequently delayed in delivery, and business retarded, if not lost, through errors in address. Since the "window" envelope is frequently used, and the inside address must perform two functions, there is a real reason for insistence upon accuracy of the inside address. It should be written exactly as it is found in the letterhead or the advertisement. If the word *company* is written out here, then it should be written out in the inside address. In fact, the firm name should be as accurately written as if it were to be put on a check. If the $6\frac{1}{2}$ by $3\frac{3}{8}$-inch envelope is used for enclosing the business message, it also should be addressed just as accurately. For facility in handling in transit through the mails, it seems better to use the indented system for writing the outside address than the block system. Both forms are, however, used:

American Seating Company
    119 West 40th Street
        New York, N. Y.

The McGraw-Hill Book Co., Inc.
370 Seventh Avenue
New York City

For the sake of courtesy, names of the months should not be abbreviated. For the sake of clearness, the date should not be written thus, 9/26/23. The abbreviations of the names of the states should follow those specified in the United States Postal Guide.[1]

The point of prime importance in connection with the mechanical make-up of the business communication is making the message easily accessible. Conformity, therefore, on the part of the writer of a business message in the matter of paper, display, etc., to the best business practice speeds up the handling of his letter in a large organization. The best business practice represents what experience in handling a great amount of material has found to be most expeditious. The engineer who will observe as far as he can the standard practices gets more prompt returns. Or at least, since he has conformed, he can demand legitimately more attention than if he had overlooked his own part in getting the desired results.

COLLATERAL READING

GARDNER: "Effective Business Letters," chap. II, III, IV, pp. 10–53. The Ronald Press Company, 1915.

HALL: "Handbook of Business Correspondence," Sect. XVIII, pp. 607–622, Sect. XXIII, pp. 721–742, Sect. XXX, pp. 960–963. McGraw-Hill Book Company, 1923.

HOTCHKISS and DREW: "Business English," pp. 103–123. American Book Company, 1916.

HOTCHKISS and KILDUFF: "Handbook of Business English," 2nd ed., sect. IX, pp. 198–221. Harper and Brothers, rev. ed., 1920.

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[1] For extended discussion of these minor points, see HOTCHKISS and KILDUFF, "Handbook of Business English." Harper and Brothers, rev. ed., 1920.

HENRY LEWIS JOHNSTON: "Parsons Handbook of Letter Headings." Parsons Paper Company, 1915.

J. W. SCHULZE: "Office Administration," chap. XVII. McGraw-Hill Book Company, 1920.

Associated Advertising, vol. 13, no. 8, pp. 6, 25; pp. 20, 21, 23, 24. August, 1922.

"Language for Men of Affairs," vol. II, chap. XIV, pp. 220–228. The Ronald Press Company, 1920.

CHAPTER VII

THE "YOU" ATTITUDE

Good tone is the final aim in the business letter. No matter how attractively the message is presented from the observance of the mechanical requirements, if the tone antagonizes or repels or is negative, these mechanical attractions have little value. They then bear the same relation to the message that veneer does to furniture.

The creating of good will, now largely a primary aim of a business communication, is dependent in a great measure upon the attitude which the correspondent takes toward the addressee. This attitude that should underlie the business communication is popularly known as the "you" attitude. By this means, the writer stresses not what he is interested in but what the client, with his individual interests and desires, needs to effect *his* purpose. The writer knows that he will directly profit only in so far as he is able to meet the needs and desires of his client. Therefore, he actually emphasizes the needs and interests of the addressee. He talks about the things which the client knows and desires. If the client is uninformed upon the subject, then the writer takes the trouble to put the information in simple and non-technical language so that the client may easily understand it.

The engineer has often failed to realize the necessity for the "you" attitude; yet he has special reason to understand the imperative need for the "you" attitude when he must give technical information to non-technical men. A great part of his professional work is with men who are not especially interested in the technicalities of engineering, but only in how engineering projects will benefit them, generally through financial returns on investments, through increased convenience, etc. Frequently the engineer must present his information and his conclusions to boards of directors, no one of whom is a technical man. If he is to win favor for the successful carrying on of his work, he must put the matter in terms with which the client is familiar, and stress the points that the client wants to know about.[1]

In his failure to appreciate the needs and the interests of the client, the engineer has been weak in the past. For this purpose, he has reason to extend his knowledge and practice of English. Even with his own colleagues, he has too often assumed too much information or interest in figures. He has overlooked the fact that the engineer himself is not interested exclusively in the reading of tables and uninterpreted figures. He, like the non-technical man, is interested in what significance his colleague attaches to the tables and figures. Even if he has the knowledge to draw his own inferences, he wants to understand what his colleague has in mind. The colleague, therefore, will profit if he uses the "you" attitude with men within the profession as well as without. To realize how important the "you" attitude is, the student has only to observe how the appeal to the interests of the technical reader is made by any technical publication or the sales message to engineers for technical books. But no matter whether the other person's interests are technical or non-technical, the engineer needs to have the "you" attitude.

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[1] F. R. Low: Wisdom and Knowledge (Editorial). *Power*, vol. 56, no. 20, Nov. 14, 1922.

In stressing the interests of the other person, however, the engineer must not entirely submerge his own personality or his own individuality of outlook. With the "you" attitude the engineer imagines how he would regard the engineering project if he had the non-technical man's training and interests; and he interprets or "steps-down" his technical ideas so that they will be clear and accurate. The "you" attitude does not mean that the engineer should compromise himself or his profession, but that he should see his chief interest in relation to the needs and desires of men of other professions.

Emphasis upon the needs and interests of the addressee cannot result from vague ideas of the client's needs and interests. The "you" attitude, to be the most successful, demands, first of all, that the engineer have some general conception of the qualities of the engineering profession that are common to all. In other words, he must realize that the aims and standards of all the leading professions are alike: (1) To do the greatest good to mankind, and (2) to gain satisfactory returns for the individual who selects the special profession. This appreciation of the common underlying aims of every profession is difficult to grasp and much harder still to put into terms that will bring the desired action. Yet the recognition of the universal purposes of the profession is a safe, unfailing course to pursue in his intercourse with men. It gives him tolerance for the interests and enthusiasms of others even though their methods may differ from his. On the other hand, it by no means detracts from his enthusiasm and faith in his own profession.

To use the "you" attitude advantageously, the engineer must have some insight into the business or the profession of the men with whom he is to deal. This is, of course, only another way of saying that the engineer must know his market and his customer. If he has enough knowledge and interest to have in his vocabulary certain words and terms that are current in the other profession, he has additional power. But it is unwise to attempt to employ the "jargon" of the other profession unless the user is sure of the meaning of the trade terms. He runs the danger of appearing ridiculous, if not insincere, to his clients. It is much safer to keep to references and terms of common interest than to blunder in the use of professional ones.

There are two means of acquiring the necessary insight into the other profession. One may be fortunate enough to have some first-hand information through experience and interest. A significant fact in this connection is that some of the large organizations which make engineering machinery are selecting, for their sales force, men whose first training has not been in the technique of salesmanship, but in engineering. These organizations feel that the salesman whose first interest is engineering is likely to have the knowledge and enthusiasm to convince others. It is a safe assertion to make that the more an engineer really knows, and the more points of contact he has with life in general, the more in demand will he be and the more can he demand.

If, however, the engineer has not been fortunate enough to have any first-hand knowledge of the professional interests of the client, he need not despair. He can get accurate and reliable information (1) by reading the catalogues and the publicity and advertising matter that the client, or firms with the client's interests, get out from time to time; (2) by reading the advertisements, the special feature write-ups in general magazines and in newspapers concerning different businesses and professions. The engineering student will find much interest and profit in attempting to work out from the catalogues, advertisements, etc., of some engineering concern which advertises widely a definite statement of its policy. By these and other available channels he can get a description of the business, its policy, its talking points, and its good points.

It is better, of course, to be able to base his judgment upon real experience and actual observation. Yet if these are impossible, then he will generally not go far wrong if he select, as a likely cause for the client's needs, one of the following:

1. Insufficient returns on money invested,
2. Inadequate and incompetent help,
3. Lack of cooperation between departments,
4. Waste of time and effort,
5. Need of expert advice and service in materials which will increase the client's business and contribute directly to his success.

All these reasons have force, when the engineer is considering the problems of individuals as well as of large organizations. He must determine which reasons seem most reasonable for the particular case.

The engineer, of course, approaches this problem of need on the part of his client from a different avenue from that of the manufacturer or the advertiser; yet he has as many different and difficult problems to meet as either of the others. He usually does not so directly seek out his client or his prospect as other advertisers do. He is sought out. Upon the initiative of the clients he is given the opportunity to render service. Nevertheless, while he is delegated to investigate and report some proposed engineering project, the board of directors may be agreed only in their faith in his ability to make the investigation they desire. As far as later action is concerned—that is, upon what methods may be adopted in carrying out the work, the amount of money to be invested, etc.—they hold suspended judgment. The aim of the engineer, when he makes his report, therefore, must be to demonstrate that the faith of the board has not been misplaced; that his facts are trustworthy, his conclusions sound and his recommendations reliable. His approach is frequently not so much in the use of any particular method at the start, but in so presenting his material, in organizing it, in phrasing it, in interpreting it, that the board of directors may understand and feel that their needs have been met.

Emphasis on the "you" attitude demands, next, that the engineer should form some judgment of the personality of his client, whether this client be an individual or a group of individuals. It is especially advantageous to know something of the temperament, the interests,—even the hobbies—of the client. In connection with this problem of understanding the client, conversation is one of the best possible means of gaining this ability—conversation which gives the other person a chance to express his ideas to an open-minded and sincere listener. If the engineer is only a fairly accurate observer, but a keen listener, he can soon get sufficient knowledge of the temperament and personality of his client to understand his client's interest in his technical knowledge.

A careful analysis of the product, whether it is professional services, machinery, or books, is necessary to effect the "you" attitude. For this analysis, the engineer must make a careful preliminary survey of the product, its material, its workmanship and its purpose. If his own services are the product, he must make a close and searching self-analysis to discover his ability, his knowledge, his standards, his aims and his ideals. He may have a clear knowledge of the needs, interests and personality of the client. If, however, knowledge of his product is insufficient, the market is still open for his competitor.

The final consideration which makes the "you" attitude effective is the sincerity of interest that the engineer takes in his client's needs and interests. He keeps uppermost in his mind, as his professional policy, what he can give, not what he can get. Stress on the getting befogs the vision of the contribution that the engineer, through his individual services, can make toward "adapting the forces of nature to the use and convenience of man." In the long run, self-seeking tactics will bring all his professional actions under scrutiny for insincerity.

The actual means whereby the engineer may incorporate that "you" attitude into his presentation are: (1) By understanding, as he is increasingly able, the point of view of the client, his business, his personality and the product. In fact, emphasis upon these points is imperative and is the only final way in which to secure the "you" attitude. (2) By actual "you" phrasing. For instance, instead of writing, "We are glad to receive your letter of October 6," to write "Your letter of October 6 has just reached us." This actual "you" phrasing is, however, frequently better to use in practice writing than in handling an actual situation. Its value in practice is that it gives training in getting the emphasis off the "we" interests. On the other hand, the actual "you" phrasing may have more "we" stress than if "we" were actually used. It is the spirit, of course, back of the actual words that creates or destroys the "you" attitude. The actual "you" phrasing conveys the "you" attitude only when it is natural, not forced. Actual "you" phrasing, therefore, is not absolutely necessary to giving the "you" attitude, nor is it always expedient.

The tone of the business communication should be personal and individual, but not familiar. As far as it is possible to do so in writing, the writer should express himself on the written page as if the addressee were sitting across the desk from him. This style of writing should not, however, lead the engineer to take the short-cuts of oral presentation or of direct conversation. These would have a tendency to be unintelligible in the written communication. There would not be the inflection of the voice, the gesture the facial expression which aid oral presentation. Writing as if the addressee were sitting across the desk from the writer implies directness in presentation, naturalness of approach, straightforwardness of statement, frankness of dealing and the use of the simple word in preference to the complex and ornate. Man-to-man wording will make for courtesy and tact, if rightly interpreted, not for brusqueness and abruptness. For instance, "Your letter of December 5 has been received by us," observes the actual "you" phrasing, but it is not the natural way a person would talk if the addressee were seated across the desk from him. He would probably say, "We have received your letter of December 5." Again, who would think of saying to the client seated across the desk, "Yours of the 15th instant received and contents noted. In reply beg to state," or "would say . . . ." The full weakness of this trite and routine beginning is apparent when it is considered as a natural way of conversing. Or take the much used complimentary close, "Thanking you in advance and hoping to hear from you in the very near future, we beg to remain." Consider this phrasing as a final one for a personal conference. The close, stated in this breathless and suspended way, is quite inappropriate for the clincher of a conference; besides, it is not natural. Much unemphatic indirectness and much awkwardness will be cleared up by direct, easy, and natural presentation.

The whole modern system of effective business communication is showing more and more the influence of the "you" attitude. All the mechanical parts of the letter, the stock, the size of the sheet, the letterhead, the display, the layout, as well as the actual phrasing of the sentences and the point of view from which one regards the situation that prompts the letter, have significance only as they make the whole letter mean something to the addressee. The writer's success, in fact, is dependent finally upon the force of the appeal which he can make to the addressee's needs and interests. Successful letters of application, of inquiry, of instruction, of order, and of sales all have used skilfully the "you" attitude.

The "you" attitude is probably the most important single point in effective communication of ideas of which the engineer ought to have a clear understanding. If he is thoroughly interested in his profession, he has ideas. He must, however, appreciate the fact that he has to take a detached and impersonal view toward his own ideas, and give thought to the effect that they are going to have upon others. The form of professional writing in which he has most need for the "you" attitude is the report. In the report, however, the engineer has failed most often to present his scientific material with the emphasis upon the needs and interests of the reader. In fact, the ineffectiveness of engineering reports generally is not due to the engineer's inaccuracies in handling his facts and figures, but to his failure to get the "you" attitude.[1]

The business communication and the report require, of course, the greatest use of the "you" attitude on the part of the engineer. Yet in every situation which he is called upon to meet as an engineer, he must employ the "you" attitude. He must present the results of his professional experience and knowledge in the terms that are clear and useful to the uninformed reader.

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[1] D. W. MEAD: Engineering, Reports. *Engineering News-Record*, vol. 85, no. 19, pp. 891–892. Nov. 4, 1920.

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CHAPTER VIII

BEGINNINGS AND ENDINGS

In maintaining the "you" attitude and the personal tone in the business communication, the beginning and the ending of the letter are important. The letter should be so presented that it can meet and overcome the handicap that arises from the absence of the living presence to attract. The problem, at the outset of the business letter, is to get the immediate and undivided attention of the addressee. To gain this end, the material of the opening sentence or paragraph must be accessible and must show an immediate and definite relation to the needs and interests of the addressee. The opening sentence, therefore, should cover and include several points:

1. The occasion for writing—the subject of the letter. This is sometimes put just below the letterhead, before the inside address, and a little to the right of the center of the page, under the head of *re.* In this case, the subject may or may not be included in the opening sentence, at the discretion of the writer. The usual practice seems to be to repeat it.
2. The reference to the date or dates of other letters if there has been previous correspondence.
3. An appeal to the reader's interests through a direct "you" reference, or indirectly through

reference to natural needs and interests. While this third point, as actually treated, is generally combined with the other two points, it is nevertheless a separate and distinct one and should always be so regarded in checking the adequacy of the opening paragraph.

The statement of the subject of the letter at the start saves the time and energy of the addressee. It gives, at the beginning, a terse, concise definition of the point under consideration. It aids also in routing the letter promptly to the right department. But this practice of indicating the subject of the letter at the beginning is not as general as it should be. The addressee frequently has to read the letter half through before he finds it. Not infrequently he has to infer the subject from the drift of the whole letter. Much time and effort are saved when the writer indicates in the opening sentence the occasion for writing—the subject of the letter. It is not always easy to get a letter to the personal attention of a particular correspondent. It is always possible, however, for the writer to phrase the subject of his letter so clearly and definitely in the first sentence that there can be no doubt as to the department which should handle it.

If there is no need for distinctiveness of personal tone in the opening paragraph of the letter, then there is need for making the subject of the communication easily accessible. Most letters, for the "you" attitude, require both distinctiveness of tone, and accessibility; but in routine letters there is greater necessity for the immediate and accessible statement of the subject than for the distinctiveness of personal tone. This demand is especially pronounced in the order letter.

As a matter of record, the date of any previous correspondence, or of any dates that have a bearing upon the subject under discussion, should never be omitted. Letters will never cease to be valuable as records. It is not safe or businesslike to assume that the addressee will know the date or have any way of identifying the particular transaction involved. If the writer does not keep his own record, he has no right to protest the decision of the man who has kept one. It might be well in passing to suggest that it is always good business, even for the man whose business correspondence is not very extensive, to keep copies of all his business letters, with the dates. The date is sometimes as important as the message itself. The writer should remember that one purpose of the opening sentence is to bring the discussion up to date, in one sentence, before he proceeds. Then his approach will have definiteness and power.

For the attention-getting value, the opening sentence should contain, directly or indirectly, some appeal to the reader's interest or need. The interest and the need of the reader should be interpreted so as to include those things that make action easy as well as profitable. The fact, also, that the whole letter should deal with but one single topic should aid the writer in giving the opening sentence the right direction.

From the point of view of the actual mechanics of putting the thought on paper, the length of sentence and the actual phrasing should be briefly analyzed. The opening sentence or paragraph must not be too long or take up too much space on the page. It should seldom be longer than the eye can take in quickly and clearly in about two glances. If it is too long, it repels interest at the very outset; it is hard to read quickly. If it is too short, it is likely to be inadequate. The length depends upon how much is necessary to bring the discussion up to date in the briefest possible form. The type of sentence, too, depends upon the individual judgment. There is no matter of judgment involved, however, concerning the inclusion of the date in every letter. While the date should not receive prominence, it should be there. This, with the inclusion of a terse statement of the subject under discussion, should practically never be omitted.

After the writer has gained the interest of his reader in the beginning of his letter, and after he has presented his discussion of the subject as far as he wishes, he still has the problem of closing his letter effectively. The ending or the concluding paragraph should summarize as the opening paragraph does. The opening paragraph, however, summarizes the action that has taken place up to the date of writing the letter; the closing paragraph summarizes the discussion in the particular letter and points the way to the immediate action which the writer wishes of the addressee. If the concluding paragraph has in it all the necessary facts for a good telegram, it is likely to be effective. This standard will enable the writer to keep his attention on the whole situation with which the letter deals. It will also help him to eliminate non-essentials which often have a tendency to creep in at the close. The closing paragraph should never be regarded as a conventional appendage which must be attached to every letter whether or no. Again, it should not be made to carry, as is often the case, the entire good will of the letter. The tone of good will should permeate the whole message. If there is no good and sufficient reason for a closing paragraph—that is, if the discussion seems quite complete without it—then there is no need for tacking one on. But if the occasion for a closing paragraph is there, then it ought to be a direct, straightforward statement of the point at issue, with the suggestion of the action desired. The tone should be natural, not forced. It should mean something. Closing with "We expect to hear from you in the very near future," "We shall anticipate an early reply," or some other direct statement that the occasion seems to demand, is far stronger than "Hoping to hear from you in the very near future." With the participial construction, the emphasis is put upon the wrong idea.

Again, a direct, straightforward statement at the close aids the addressee in knowing definitely what the writer expects of him. People would frequently do what others wanted them to do, if they just knew exactly what was wanted, and had suggested to them how easy the action was. Note the definiteness and the ease of action which is suggested by the close: "Just fill out the enclosed blank, attach your check for $2.50, slip it into the enclosed envelope and drop it into the nearest mail box." The definite close can be used not only for a sales letter but also for all letters which the engineer may be called upon to write.

As has already been hinted, a person has to be a complete master of his own ideas before he can expect them to be of use to him in mastering other people. He cannot execute successfully unless he knows his own mind. A direct statement at the close of the business letter is valuable to the writer also. By this means he can indicate that he has the situation thoroughly in hand. If he has given thought as to what he will say as the final word—whether he commits himself or not to any final and outspoken policy—he has boiled down his ideas until he knows where he stands. This definite knowledge will make him secure in his own position; it will tend to give him added confidence in his own decision. This confidence, in turn, will give him increased power in effecting the action which will benefit him.

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CHAPTER IX

THE LETTER OF APPLICATION

The successful technical man must be well acquainted with himself. He must know his capacity for work, his degree of interest in his profession, the ends toward which he is aiming and the methods to use to secure these ends. It is profitable, therefore, for him to take an inventory of his qualities, characteristics, and qualifications which have economic value.

The letter of application is the one in which he makes direct use of his inventory. By this letter, he plans to impress men out in the industries with his potential possibilities for the positions which they have need to fill. A study of the letter of application, therefore, can do two things for the engineer:

1. It can aid him in knowing himself and the problems involved in selling his services.
2. It can give him facility in presenting his individual qualifications in a concise, accurate, orderly, and emphatic form.

The results are forthcoming whether the student expects to use the letter as a means of obtaining a position or whether he expects a personal interview to accomplish his purpose. The knowledge of himself and the organization of his qualifications are the important things.

The prospective employer needs a definite and an accurate record of the student's training, experience, interests, and activities. The engineering student who would begin his professional work successfully ought to make an analysis of his individual qualifications that have money value.

J. W. Schulze, quoting from the unit on *Analyzing Yourself*, in the Business Training Corporation course in *Business Essentials*,[1] enumerates the traits required for success as the following:

I. Physique
    1. Health
    2. Appearance
II. Mental Ability
    3. Observation
    4. Concentration
    5. Memory
    6. Imagination
    7. Reasoning
III. Knowledge
    8. General
    9. Business
    10. Expression
IV. Disposition
    11. Ambition
    12. Confidence
    13. Loyalty
    14. Enthusiasm
    15. Cheerfulness

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[1] J. W. Schulze: "Office Administration." chap. III, p. 17. McGraw-Hill Book Company, 1920.

For an interesting list of human qualities which may be rated, see also pp. 14–15 of this same chapter of "Office Administration."

V. Action
  16. Reliability
  17. Energy
  18. Persistence
  19. Initiative
  20. Self-control.

A practicing engineer[1] with a wide knowledge of men has made out, under appropriate divisions, a plan for an inventory of character and personality. The details of this inventory may be studied and used by referring to the complete chart at the end of this chapter. It is sufficient here to list only the main headings:

I. Physical Characteristics
II. Spoken English
III. Education and Scholarship, including Written English
IV. Ability in General
V. Business or Financial Aptitude
VI. Moral, Social, and General Characteristics
VII. Habits and Associates.

These represent what this practicing engineer has decided are qualities which he rates when he is considering technical men. The student engineer will profit if he will spend some of his spare moments in checking his own qualities by the detailed list on pages 96–100. "Their value is, of course, dependent on the impersonal fairness or honesty of judgment used."

Education, scholarship, and experience are usually the only qualities to which direct reference can be made. All the other qualities and characteristics are equally important. They, however, can be only suggested or interpreted into significant facts, the product of the personal qualities listed by Mr. Schulze under *Disposition and Action.* The young engineer expresses his ability to succeed far better by writing:

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[1] Dr. F. H. Newell, Co-editor of *Engineering as a Career*, former head of the U. S. Reclamation Service. One of the Founders of the American Association of Engineers.

> While I hardly feel my experience to be of great value to a factory employer, I feel that I have had some raw edges taken off. Possibly this would quicken my future usefulness in the works.

than if he had attempted a definite bald statement about his confidence in his own ability. Another creates quite the opposite impression when he writes:

> Salary would depend on the location & size of plant and amt. of my time whole or part which the situation would require. Kindly send details of work required and oblige.

Without expecting or intending to, he has conveyed some very definite information about his character. His main interest seems to be the salary; he considers mechanical accuracy in writing unimportant; he has not a very definite idea of the position for which he is applying.

> When one is asked to go through forty or fifty letters to pick out men that are worth while to consider further, one becomes critical, and the form of the application counts for much. Things which probably the writers of these letters would not have considered of importance had their weight, particularly as the work included reports to the office which would be published later and the form of the original would make our work easier or more difficult.[1]

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[1] Some Letters of Application. M. I. T. '92 to Professor Bates, p. 1.

The engineer, therefore, must carefully plan his letter and decide what is best said, what best omitted, and in what order the facts might be best arranged.[1]

Those who have written extensively on the selling of personal services list a great variety of sources of information about positions open.[2] It is well for the young engineer to have a knowledge of all the possible ones. It is probable, however, that on his first job he will depend upon one of three:

1. The advertisement in the technical publication.
2. The information of a personal acquaintance.
3. His own general interest in getting into work for which he has been trained in college, and for which he has enthusiasm.

No one single letter of application can be worked out that will cover, without some modifications, all these sources. A man's own best services are too personal and valuable a commodity to sell wholesale. The engineer, in fact, should use as much individuality in the different letters of application which he writes as he would in dealing with his different friends and acquaintances. The facts of his education and his experience, of course, are unalterable. The method of presentation, however, should vary with the primary interests of the prospective employer. Each individual letter of application should be planned to cover adequately only one situation.

After the engineer has a definite idea of his personal characteristics which have economic value, and after he has decided upon the prospects that he will approach, he should check up his training and qualities for the special position. This process involves a rapid and comprehensive survey of all his possible characteristics and qualities with money value. He should apply only for those positions for which he has aptitude, training, and enthusiasm. There is no worse failure—more bitter or more far-reaching in its consequences—than that which comes from an engineer's over-reaching himself, or under-estimating his tenacity of purpose. He becomes hopelessly confused and is overwhelmed completely by the uncongenial work. He needs to be definitely sure about some one aspect of the work or about some qualities in himself before he undertakes a new work, particularly if he is inexperienced.

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[1] Some Letters of Application, M. I. T. '92 to Professor Bates, p. 6.

[2] William L. Fletcher: Getting a Job When You Graduate. *Ohio State Engineer*, vol. 5, no. 4, pp. 11, 13, 25, May, 1922.

His formula for success, like that of Alexander Graham Bell, should be, "observe, compare and act." He has no alternative but to build upon what he already has. He must begin, at the very outset, to discover relationships in his work—relationships with what he has previously known and with what he aspires to be. Not until he starts getting relationships can he begin to give himself generously to his work, without the blight of fear and self-consciousness. Employers lament the fact, however, that all too frequently the young engineer is more interested in selling himself at the highest possible price, instead of selling himself on his definite, broad, and far-reaching aim and his willingness to start in the ranks, and, by service rendered, work up to the responsible positions with the desirable salaries.

A well-known engineering company that employs technical graduates, in one of its series of advertisements in student publications, offers this very significant comment to senior engineering students:

> Years of steady plugging must go before you can handle the man-sized responsibility of running a team. That this is just, seniors will be the first to assert. They have seen how well it works for team and college. Then let the seniors keep this point of view, for soon they will find how closely the principle applies to themselves in the business world.
>
> Captains of industry are not made overnight. Don't expect to step into a managership right away. Before you can lead, you've got to serve in the ranks awhile.
>
> This is best for your organization and best for you. The time and energy you put in working up from the bottom, taking the bitter with the sweet, getting the upper hand over your job, will stand you in good stead when you have won through to an executive position.
>
> When you have learned how to handle detail work, you can begin intelligently to direct other men to do it, and thus free yourself for creative planning.[1]

When the engineer has marshalled all his salable qualities and has analyzed the demands of the prospective position, his next problem is to select those qualities which have special value for the particular position. All of an engineer's best qualities and characteristics are, of course, called for in any position worth the time and energy of the technical graduate. Different positions, however, put stress upon different qualities. Mere average ability should not deter a man if his interest and his enthusiasm are keen.

If, in analyzing yourself, you find that you have not excelled in any way, use this fact as an argument. Generally, business men are not looking for boy "wonders;" they don't want men to revolutionize their business. What they desire are men of average intelligence, with open, alert minds who have some appreciation of the importance of discipline and are willing to work and study hard to get ahead. In other words, turn every objection into an argument when you can possibly do so.[1]

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[1] No. 18 of a series in student publications, Western Electric Company.

The engineering student, oftentimes in his first letters of application, does not always make the most of his education. He does not know how to relate it to the work which he hopes to get. He assumes that the simple statement that he is just completing his third year in the college of engineering, or that he will be graduated in June with the degree of Bachelor of Science in Civil Engineering, gives sufficient information. It gives the prospective employer, however, only a slight inkling of what the student may have to offer specifically.

There are, for instance, several subdivisions of civil engineering To any one of these the student may have given extensive study—railroad engineering, highway engineering, hydraulic engineering, municipal engineering, structural engineering, sanitary engineering. He must not take for granted, therefore, that writing to the American Bridge Company will indicate to the employment manager of this company that he is especially interested in structural engineering. He must relate the course and the individual studies within the course definitely and clearly to the needs and requirements of the individual prospect. This indication of relationship is particularly necessary if the technical graduate has no practical experience to offer. For he must in this case sell his potential, yet untried, possibilities. These can be indicated only by the results he has to show for his enthusiasm and interest during his college years.

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[1] William L. Fletcher: Getting a Job When You Graduate, President of William L. Fletcher Company, Inc., 641 Boylston St., Boston, Mass. Copyright held by Engineering College Magazines Associated. *Ohio State Engineer*, vol. 5, no. 4, p. 13. May, 1922.

It is rather unusual, however, for the technical graduate these days not to have some practical experience to offer. Colleges of engineering are more and more insisting that their students spend the summer months in the industries. The industries have also shown some tendency to take men after their third year, for summer employment. By this means, employers often discover, with less waste than is possible later on, whether these men are worth keeping in mind for positions after graduation. There are many arguments in favor of the extension of this practice, both from the employer's and the technical student's point of view. The cooperative system, which divides a student's time between actual industrial work and study, is another means of solving this problem of aptitude, both for the employer and for the student.

The summer employment that the engineer selects need not always lead directly to a position with the one company. It ought to be a foregone conclusion, however, that he will select summer work, whenever it is at all possible, in the industry with which he expects to be associated later. He may consider that he is dependent upon the amount of money he can earn during these few months for completing his college course; yet the financial returns of summer employment for the engineer ought to be the secondary consideration. Opportunity for insight and practice in related work, if not in the actual work he expects later to make his profession, should receive first consideration and should largely direct his choice. If, therefore, the engineering student, in the selection of summer employment, invests for his future profession, he can offer these few months of summer work under the head of experience. He can feel also that it will have more significance than if he offered just "summer work," the only value of which is indicating that he has not been idle and that he is not entirely ignorant of how business is carried on. Getting related summer work indicates real interest in his chosen profession, initiative, an appreciation of values, and a sense of relationship. These few months of experience are often overlooked by the student when he is asked to state his experience. He considers that all that is really worth anything is that covering a year or two. While, of course, a period of a few months does not give a student sufficient opportunity to size up himself in the work, or to be sized up finally, these few months will indicate a strong tendency. And if the summer work is carried on over several successive summers, it has cumulative value.

If the student is inexperienced and has done practically nothing but go to school all his life, he still has means of definitely indicating his potential possibilities. The sources of his evidence are his attitude toward his college work, his scholastic attainments and his community interests—the way he recognizes and seizes the opportunities open to him as a student.

The third-year men, for instance, who had the opportunity to help on a senior boiler test and who stayed through to the end, in spite of the hard work and no credit, indicated to the instructor that they had enthusiasm, a sense of responsibility, tenacity of purpose, and real interest in the work. Unconsciously, they gave the instructor information on their potential possibilities and a basis for rating and for recommendations later on.

The inexperienced writer of the letter of application often has only a vague idea of the kind of letter that is required. Obviously, it must conform in all the mechanical details with the best practice for the business letter—a good quality of paper, an 8½ by 11 inch sheet, attractive and accessible display, accurate and clear statements, clean copy. Ladies' note paper, a note-book sheet, lined paper are never in good taste. Men who employ engineers usually do not demand that the letter of application be in the applicant's own handwriting, with the exception, of course, of the signature. In fact, men have become so accustomed to the typewritten letter that a pen-written letter actually slows down the handling. If, however, the engineer is obliged to submit his letter in long hand, he should pay particular attention to display and legibility. If he is reasonably sure that his letter is to go directly and unopened to the addressee, he should also give special consideration to the envelope he uses. The large-sized envelope in this case has high attention-getting value.

In the actual letter itself, all that is wanted are the facts, together with as clear a statement as the applicant can make of the kind of work he is seeking.

> A straightforward, logical, and simple statement of the facts arranged in chronological order and set up in easy, readable form is always well received

comments one employer of engineers. And another says:

> letters which have been carefully written and which indicate clear thinking on the part of the applicant are always given careful attention.

Others still might be quoted who stress the same points—definiteness and clear thinking.

The letter of application, for the engineer, therefore, resolves itself into a study of the best way to present the following points:

1. *Source of information*, if there is any, or occasion for writing.
2. *A definite statement* of the kind of work desired.
3. *Education*—number of years in college and special interest. There seems little need, in case one has college training to offer, to go into detail about the secondary school training unless it has in it some outstanding features which would not usually be included in the entrance requirements for college. If, for instance, in the secondary school, the applicant has taken stenography and has become proficient, he has this additional qualification to offer. It is always well to state what phase of engineering has been of particular interest. If a student in mechanical engineering has been especially interested in gas engines, he ought to state the fact in his letter of application. Under the head of *Education*, however, it is not advisable to

include too much detail. All that is required here are the facts so stated that the relationship is clear and the interpretation can be easily made by the reader. Wherever possible, the tabulated form is the best.

4. *Practical experience.* This should include all the practical experience the engineer has had, if for no other reason than to give the prospective employer an accounting for the period when the applicant has not been in college. The most significant reason, however, is that it gives the employer some means of judging of the enterprise and the inherent interest of the applicant in his work. Here again the facts are all that are demanded—accessible facts, with the opportunity for relating them to the particular work.

   No matter how many letters the engineer may write, the facts of education and practical experience are always the same. When the student has organized them once, he has them ready for all times.

5. *Interpretation of the facts under Education and Experience.* According to the individual position that the engineer has in mind, as he attempted to state it under 2, the significance that he attaches to these facts varies. This varying significance, however, never means that he should ever twist or misrepresent the facts. He may, however, shift the emphasis to suit different positions and different occasions. This is the section of the letter of application by which he makes the individual appeal. This is the part that he changes from letter to letter. This is the part that

requires the most attention and the best handling for restraint and emphasis. This is the part also that shows just how definitely the applicant understands the exact requirements of the position. This is the part that is always included in the letter. It cannot be put into tabulated form. It requires complete statements.

6. *References.* The names and accurate addresses, with the business connections of at least three persons who are able to speak authoritatively upon the ability, personality, and character of the writer, should generally be given. It is always well to arrange these names and addresses on the page in the most accessible form, so that they can be taken off without error. The form used for addressing the envelope is always good. For instance,

Professor James C. McClelland
Head, Department of Civil Engineering
Ohio State University
Columbus, Ohio.

Mr. R. K. Clark, President
The Clark Manufacturing Company
2053 South Third Street
Cleveland, Ohio.

By this display, the names and addresses may easily be taken off with small likelihood of error.

The selection of those whose names are to be used as references should be carefully made. To have significance, the references must present unbiased comments concerning the persons about whom they are given. As a person usually selects only those who are likely to be favorably disposed, obviously employers do not always attach final importance to the comments of references; hence the practice of asking for the name of the last employer along with the names of the other references. It is not, of course, a foregone conclusion that the last employer may report unfavorably, but it is likely that he will write frankly about the employee, and frankness is what is desirable in the comments made by the references—frankness and fairness.

The applicant should always be careful, even under the most auspicious circumstances, to refer only to those who have in some way first-hand knowledge of his work and personality. If there is any reason to question whether the referee will have any feeling against having his name used, then the applicant ought to ask his permission. In fact, even if there is no cause to question his willingness, it is only courtesy to ask permission to use the name of another as sponsor or backer. College students all too often take for granted that recommending them is one of the duties of the instructor, and of the head of a department. It may be, but it does not relieve the student from observing one of the amenities of life. He will be surprised, too, at the response and interest that the busy, overworked instructor will give him personally, as the result of just this little personal consideration.

Where classes are large and the students have little opportunity to know their instructors personally, every occasion which offers should be seized. In this instance, the student has a natural and not forced reason for calling himself to the notice of the instructor. He does not need to hang back and wait for the instructor to take the initiative in establishing some personal relation between them that will be mutually profitable. Incidentally, this suggestion concerning getting the referee's permission and selecting the names carefully will apply also when the student gives the names of references on his application blank for membership to any one of the professional societies. It is especially necessary if the student has not kept in direct communication with his referee. Otherwise, he is likely to put his referee in a somewhat embarrassing position, for the referee in fairness to himself must either make his statements refer only to the past time when he was quite familiar with the applicant's qualifications and let the reader infer that the applicant has probably these same qualifications still (which does not necessarily follow), or he must make general statements about the student that have to do with his past record only.

Impersonal letters of recommendation, handed out promiscuously, when an employee leaves a firm in good standing, and addressed, "To whom it may concern," have little value, except as a voucher for the applicant's account of his experience. For giving any light on the personality and individuality, they are practically valueless.

The value of the references is that they can make statements about the character and personality of the applicant which he cannot in good taste make about himself. Of course, they may also give the prospective employer the unfavorable points which the applicant would not be likely to present about himself. The one thing the applicant has to keep in mind is that he should give the names of those persons who are in a position to know enough about him to offer a fairly accurate estimate of his qualifications for the work for which he is applying.

7. *The conclusion.* The conclusion should indicate just what the writer wishes his letter to accomplish. The test for the concluding paragraph of any letter can be successfully used for the letter of application; that is, whether it conveys in telegraphic form the suggested action. While the results of the letter of application are frequently not final—employers usually want to interview personally men of collegiate rank—the letter of application, if it is successful, brings the opportunity for the interview.

It is frequently better to have applicants apply in person. Not only will a few minutes' conversation with each serve to eliminate those obviously unfitted, but usually a more satisfactory preliminary estimate can be made of a person in this manner than by attempting to base judgment upon a letter. Letters of application are written to create a favorable impression; therefore they are generally strained and do not reflect adequately the personality of the writer.[1]

[1] J. W. Schulze: "Office Administration," p. 21. McGraw-Hill Book Company, 1920.

The conclusion should always make action easy. In this case, the action wanted being the interview, it is well to repeat the exact address, so that a letter will reach the applicant promptly; to give the telegraph address if it should differ, and the telephone number. If conditions are such that the appointment will probably be made by telephone, a definite time at which the applicant may be reached or at which it will be convenient for him to call should be set. This latter suggestion might be used advantageously far more extensively than it is. It will save time both for the prospective employer and for the applicant. The employer will not be required to make a schedule, but can quickly discover when he can fit the free hours of the applicant with those of his own. He will get also a favorable impression of the applicant, for this method suggests that the applicant is carefully and definitely planning his time—not aimlessly waiting for something to turn up. This practice will save the time of the applicant, also, in that he will have more freedom to look elsewhere while he is awaiting the results of his letter. He can be easily reached when needed without the message having to be relayed to him, inaccurately transmitted perhaps, or the opportunity lost entirely, because he has not been at hand to go immediately to the interview. Sometimes being absent will make him lose the interview entirely. Under any circumstances, he slows down action, for either he must take the initiative, or he will run the risk of drawing too much attention to himself in getting in touch with the employer.

If the engineer is writing to a person in another city, he can suggest the time at which he will be free to make the trip; or if he is likely to be in that city within a reasonable length of time, after writing his letter, and if the need is not urgent, he can give the date at which he is likely to be there. Senior engineering students who intend to apply for positions in the industries which they visit can often use this last suggestion to their profit.

Good types of concluding paragraph might be the following:

I shall be glad to come to your office for an interview at any time that is convenient to both of us. I can be reached, between 9 and 11 o'clock each morning, by calling Garfield 1593.

If my qualifications seem to meet your requirements, I shall be glad to come to Cleveland some Saturday for a personal interview.

If you are interested in my qualifications, I shall be glad to have a personal conference with you, when, as a member of the Inspection Party from the senior class of Ohio State University, I shall be in Cleveland, May 24.

These are the points to be considered in the writing of any letter which is expected to sell personal services. But not all of them are necessarily included in the body of the letter that is sent out. Employers, in fact, differ as to what they want in the actual letter. Some want just the statement of the position desired and the most concise tabulation of the necessary facts concerning experience and education. In this case, some prefer to call the sheet "a record of qualification," not a letter of application. The student, however, should not make the mistake of omitting the complete preliminary survey suggested previously, before he makes out his "record."

Another letter of application includes all seven parts between the salutation and the complimentary close. This practice has some advantages, perhaps, though its disadvantages probably outweigh the advantages, for usually in this type of letter it will be necessary to use more than one sheet of paper to get everything in. Though the letter may be complete and unified, the mere fact that the reader has to turn to another page distracts his attention; consequently some of the force of the whole letter is lost. If the writer is obliged to use more than one sheet, then he ought to plan to get all the important facts and figures on the first page, and use the second for the interpretation and the close. These, while necessary to the "you" attitude, are not vital to the presentation of the facts which should create desire for the action that the concluding paragraph suggests. Companies which employ engineers often have a very large single sheet for an application blank for the very reason that the material on a single sheet is more accessible than if on several sheets, and that it is not so likely to get lost in the files.

The third type of application letter is the one with the data sheet. The actual letter, in this instance, consists of the definite statement of the position wanted (2), the interpretation of the facts (5), and the concluding paragraph (7). The problem in this letter is so to arouse the curiosity and interest of the reader that he will want to make an extended study of the data sheet. This letter with the data sheet is probably the best one for the engineer to use. It will be acceptable both to the employer who wants only the "record of qualifications," and to the one who wants the letter. Another good feature is that it is easier with the data sheet to put the material in good form. This letter to accompany the data sheet is a hard letter to write, though much worth the effort, because it will not be result-getting unless the writer can state his object in seeking work with the particular company, and unless he can so present the necessary interpretation of his facts that he can get the reader to turn the page and look at the data sheet. Though two sheets are used, it has not the disadvantage of the two-page letter referred to in the preceding paragraph. The data sheet is complete in itself. It contains everything that can possibly be put in the tabular form. In addition, it may have—in the upper right-hand corner—the name and complete address of the applicant. It may also contain a concise statement of the position wanted. In fact, the data sheet should include everything that the usual application blank does—age, education, experience, military experience, activities, references. Indeed, the data sheet may well be considered as an application blank which the writer has worked out for himself.

It will not come amiss if the engineering student, some time before he begins writing for positions, should make out for his own information a data sheet which he decides will cover, in the best tabular form, his own case. He may compile this from two or three of the application blanks which have come to his attention. For this purpose he will profit by studying closely the application forms for membership of the national professional societies, such as the American Society of Mechanical Engineers, the American Society of Civil Engineers, the American Institute of Mining and Metallurgical Engineers, the American Institute of Electrical Engineers and the American Association of Engineers. These application blanks for membership include points that might well be considered by the engineering student when he is organizing his campaign for selling his services and may suggest the arrangement of topics on the data sheet. These blanks also give certain instructions which it is well for the engineering student to bear in mind. They represent what practicing engineers demand in the way of background and achievement for membership in a professional society.

The engineering student, at times, can save himself effort and yet stand a good chance of meeting the definite issues of the particular position, if, instead of writing a letter of application first, he will ask the company for which he would like to work to send him an application blank. After this has been filled out and is ready to be returned, a letter of transmittal, in which the points that need interpretation are stressed, can be attached. This is obviously a modified data sheet letter. By this means, the engineer can emphasize and interpret the facts in relation to the particular interests of the given company. By such a method, he can make the facts that are alike for all letters have individual significance. In stiff competition, the writer can show, all other things being equal, how he has special qualifications for the work.

In answering advertisements a student ought to select only those which require qualifications which he seems to have. It is not wise to "bluff." Of course, there are not so many advertisements for the inexperienced engineer to answer, but there are some. When he does, he should, first of all, analyze the advertisement to discern the issues. It is sometimes well to set them all down. Take, for instance, the following:

EDITOR WANTED FOR POWER-PLANT PAPER

> Prefer man between 28 and 35. Must be thoroughly familiar with power-plant equipment and have had several years' experience in the operation or design of power plants. Technical education preferred, but equivalent training acceptable. Must be a man with ideas and have ability to write a simple, direct style in the language of the operating man. Give detailed experience.
>
> P-919, Power
> 10th Ave. at 36th St., New York City

The engineer who replies to this advertisement ought, first of all, to be interested in writing. This interest is, perhaps, a foregone conclusion to be derived from the fact that he has decided to answer this advertisement. A brief outline of the issues might give this: (1) Age; (2) familiarity with power-plant equipment; (3) experience in operation or design; (4) education; (5) evidence to indicate ideas and ability to write. Now, with this outline before him, the applicant can check these five items with his own material. He will discover, at the very outset, in what he has the required general qualifications, and then in what abundance he has the particular asset wanted—facility in expressing ideas "in the language of the operating man." This outline may or may not suggest the way he will finally present his material. This advertisement, however, seems to suggest the handling in a fairly logical and natural manner, and the analysis can well be followed. In fact, it is well to follow the lead of the advertisement wherever possible. Not until the engineering student has thoroughly analyzed the advertisement, and checked up his ability for meeting the requirements, is he ready to write the actual letter. Now, when he does, he should meet the issues squarely and in detail.

> CHIEF steam engineer wanted for medium size industrial plant located in Massachusetts. Give full information regarding yourself, your experience, and send references in first letter. P-901, Power.

This next advertisement is not so easy to analyze. The applicant must work out its issues in detail for himself. Again, it probably can be assumed that only the man whose main interest is in steam-power plants will select this advertisement. The analysis might result in this outline:

1. Full information regarding self.
    - (*a*) Age
    - (*b*) Education
    - (*c*) Professional society membership
2. Experience.
3. References.

It is somewhat difficult to determine just what should be included under "full information." It will probably have to be interpreted to mean what the employer may want to know about personal matters. Age, responsibilities, and religious and fraternal affiliations will give some information about the applicant. Here again, after the analysis has been made, in the actual letter, the points upon which the advertiser asks for information should be fairly met. If no other plan for presentation in the letter seems more desirable, it will be a good plan to follow that with the data sheet or the application for membership form to which reference has already been made. Here is one of the times when the personal data sheet which the student has made out for his own use will also be helpful.

Still a third advertisement offers another problem in the issues:

> **WANTED**
>
> **Detailers and Checkers**
>
> on bridges and buildings; state experience, salary and date could report.
>
> P-310, Eng. News-Record.
> 935 Real Estate Trust Bldg., Phila., Pa.

In this advertisement, too, the inherent interest is assumed to be the motive which prompts the selection by the engineer. The outline might run thus:

1. Statement of education to indicate skill to be included, though not asked for.
2. Statement at outset to indicate choice between bridges and buildings.
3. Experience.
4. Salary.
5. Date for reporting.

In meeting the issues in the actual letter there is one point that needs special consideration, because it occurs so frequently in employment advertisements. This point is the salary. Of course, stating of the salary by the applicant gives the employer another means of rating the applicant. The better policy for the applicant is not to put himself on record for naming his salary. This policy gives him independence; yet he should not omit all reference to salary. He can handle it in some such fashion as this:

> As to the salary desired, I should expect it to be commensurate with the value of my services to you.

By some such means as this, the responsibility for the naming of the salary is placed where it belongs—upon the employer. The applicant has the increased confidence that results from his freedom to accept or reject a definite salary which the employer names. Besides, if the applicant takes the attitude of expecting the salary returns to be dependent upon the services he can render, he has the stress where it rightly belongs—upon what he can give, not on what he can get.

The applicant should hesitate long before he should be willing to admit to himself, much less to a prospective employer, that the money interests are the primary ones. Very frequently, the naming of a definite salary in the letter of application does convey an unfavorable impression to an employer. One employer of engineers makes this comment:

> It is really amusing to see the efforts people put forth in their written applications and letters of endorsement to sell themselves at as high a price as they can.

The young engineer, therefore, before he overstresses the salary he desires, should understand clearly just what this meeting of the salary item involves. He can make his handling of this point work in his favor.

One detail in the opening paragraph of the letter of application not to be overlooked is a direct statement describing the position, as far as possible, in the exact words of the advertisement. Another detail is that there should always be a direct reference to the source of the advertisement and the date when it appeared. For instance, recalling the first advertisement: "In answer to your advertisement in the March 16 issue of Power, for an editor for a power-plant paper, etc." This is just a suggested way to phrase it. The occasion and the personality of the individual writer will suggest a variety of ways for phrasing for record, definition, and routing.

Numerous advertisements request that full details be given in the first letter. Even when this request is not made, this practice is wise, for the purpose always is to accomplish as much as possible with a single letter. Voluminous correspondence, in any case, is undesirable from every point of view. While the result of the letter of application is usually the opportunity for a personal conference, the letter should always aim to land the job. Only with this objective does it become forceful enough to get the interview. It is also well, of course, for the writer to keep something in reserve. Restraint rightly gives the impression of power. Yet keeping some effort in reserve does not, under any circumstances, ever mean withholding any of the essential facts in the first letter. The writer, however, may suggest in his letter that if the facts prove of interest, then there are more relations which may be established or more means of emphasis. This reserving of some aspects as an additional resource holds good for all letters of application, irrespective of how they are motivated.

When the letter of application is the result of information given directly to the engineer by another, the analysis is a little more difficult to make. The description that the person usually gives of the position vacant has a tendency to be vague. The applicant, however, for the best success, must reduce the description to definite, working terms. He has to analyze very closely to find the issues. If he will put the essentials of the position into the form of an advertisement, he will find the issues more readily. Generally, it is well to ask the person who gives the information whether he will permit the use of his name in the approach of the letter of application. In fact, it is only in the opening paragraph that the actual letter differs from the others. The name of the informant is used thus: "Through Mr. A. L. Jaynes, I have just learned, etc." This opening has practically the same value as if Mr. A. L. Jaynes had taken his business card and written on it, "Introducing Mr. V. K. Roach." It gives the applicant direct access to the employer. It should also have a tendency to predispose the employer favorably toward the applicant. It can do little else.

After an engineering student gets the opportunity for the interview, the entire responsibility for presenting his own case rests with him. He is responsible not only for the qualifications which he has to offer, but also for the organization of his material and for his generalship of his faculties. In the written application, his task is comparatively easy. He proceeds along the lines suggested for the handling of any letter of application. In the personal interview, the matter presents difficulties, chief among which is self-consciousness in the presence of the prospective employer. To meet this weakness and overcome it, the applicant should have ready to present for study, by the interviewer, some written material. This may be facts which he has not already at his disposal, evidence which he has not already seen, significant papers, drawings, sketches, etc. By this procedure, the applicant can naturally get the attention off himself personally and focus it upon the situation. In this case, he will discover that he can often make some comments about himself with good taste. He makes questioning easier for the interviewer. Incidentally, it is well to suggest, in passing, that even when the student going to a personal interview is reasonably sure that the interviewer will have the facts at hand, he ought to prepare for an emergency and go to the interview with something definitely put down on paper.

Writing a letter of application to an organization to which the writer has no direct occasion for writing other than a definite desire to become connected with that organization brings out considerations not present in either of the other two types of letter. To some extent, at least, it can be naturally assumed that the applicant has some definite idea of what the organization stands for; that he has taken some means to become familiar with its products or policies; and that he has a clear idea of his purpose.

But it is well for him to re-analyze his knowledge, perhaps briefly outline it, before he attempts to write a letter. He must be thoroughly familiar with the talking points of the firm. He must also see clearly where his interest lies in relation to the firm. Then he must attempt to formulate as definitely as possible the kind of work he is seeking. This statement of the kind of work sought requires careful study, especially if he has been able to get only very general information concerning the organization. But this formulation of the definite position desired and its clear, concise statement are the most important considerations in this third type. The facts for this letter are those that are common to all letters, but the approach differs. Besides being definite, it ought not only to show maturity, and restraint of statement, but it ought also to convey the idea of sincere, honest interest and enthusiasm on the part of the writer in the possibilities of the work through what he can contribute.

This letter, to be especially effective, should focus the attention of the prospective employer upon the service the applicant desires to render because he likes the work. This sincerity has high sales value.

It indicates that the applicant is taking the long view upon the work and is probably ready to work up through the ranks. In the long run, the engineer who is willing to serve his apprenticeship faithfully and well, realizing, however, that it is an apprenticeship, usually achieves and maintains his success.[1]

The valuable points of the letter of application, therefore, for the engineer are that it gives him the opportunity, first, to rate himself; second, to analyze the job; third, to relate his qualities to the requirements of the job; fourth, to organize his material; fifth, to present his material to another person in such a manner that sanction and active cooperation of that other person can be won. Whether or not the engineering student gets his future position by written application or personal interview, or by a combination method, the benefit from an intensive study of the problem of selling his services is lasting. He begins to get insight into his relation to the life and work about him—to measure himself. It is the letter that serves him best when he starts his work as an apprentice, or as an assistant to an executive. It is not what might be called the letter of the executive. It is the means whereby the engineer, with his technical college education back of him, may demonstrate immediately after he starts his practical apprenticeship, his potential possibilities.

Through a study of the range of the letter of application—its purpose and an accurate rating of his product and his market—he sells his product, his professional services. Incidentally, if his work as an executive later demands that he rate men through their writing, his own application and a study of its technique will stand him in good stead. The intensive study of the letter of application by the engineering student has, therefore, a twofold result: (1) It will enable him to demonstrate in writing to an executive that the employing of the writer is a good investment; (2) it will be a profitable investment in knowledge and insight of individual and personal qualifications that have economic value. These will be capital when the engineering student becomes an executive and has a part in the selection of men to carry on engineering projects.

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[1] The student will gain insight into the attitude of the practicing engineer toward the young engineer by reading the editorial, Maintenance of Morale Among Younger Employees, *Power*, vol. 56, no. 3, p. 99, July 18, 1922.

The *Engineering News-Record*[1] not long ago, under the caption, Ten Tests of an Efficient Assistant, had this paragraph:

> Engineers in executive positions who may have occasion to sum up in concise form the qualities they seek and value in subordinates will be interested in the following list on which British Civil Service Employees are rated for promotion: (1) Knowledge of department (or branch). (2) Personality and force of character. (3) Judgment. (4) Power of taking responsibility. (5) Initiative. (6) Accuracy. (7) Address and tact. (8) Power of supervising. (9) Zeal. (10) Official conduct.

The speed with which the young engineer advances through the ranks, after college, will depend largely upon the degree to which he possesses and acquires the qualities listed above or similar ones. The letter of application offers the means during the undergraduate days of discovering his own personal qualities of economic importance. Another excellent point derived from its study by the senior engineering student is that he may test out the theory connected with this letter at once and see if it works. If it works, he can immediately capitalize it for his professional needs and interests.

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[1] *Engineering News-Record*, vol. 88, no. 10, p. 792, May 11, 1922.

So that the student may have the opportunity to take stock of his personal qualities and characteristics, the table, prepared by Dr. F. H. Newell, for an inventory, which has already been referred to in this chapter is given in full:

AN INVENTORY OF CHARACTER AND PERSONALITY

Each person, after careful reflection, is requested to place a check mark in each line over the one word which in his opinion best expresses his own characteristic or that of the other person with reference to whom he is preparing this estimate. The results will be considered confidential if so marked. Their value is, of course, dependent on the impersonal fairness or honesty of judgment used.

This inventory refers to................Date.. ......192..
Prepared by........................

I. Physical Characteristics

1. *Countenance:* Inert, pleasant, reposed, smiling, merry.
2. *Expression:* Repellent, frigid, sober, serious, winning.
3. *Aspect:* Stupid, dull, quiet, bright, vivacious.
4. *Attitude:* Weak, discontented, abstracted, sympathetic, strong.
5. *Figure:* Slouchy, stooping, round-shouldered, erect, commanding.
6. *Walking Step:* Shuffling, loose, apathetic, quick, elastic.
7. *Sitting:* Uneasy, awkward, careless, alert, erect.

8. *Body Control:* Fidgety, restless, quiet, reposed, dignified.
9. *Health:* Bad, poor, fair, good, excellent.
10. *Clothing:* Ill-chosen, showy, quiet, unobtrusive, stylish.
11. *Impression:* Untidy, slovenly, clean, neat, attractive.

II. Spoken English

12. *Voice Quality:* Indistinct, weak, medium, strong, powerful.
13. *Voice Tone:* Repellent, indifferent, modulated, pleasant, attractive.
14. *Voice Expression:* Lisping, drawling, nasal, monotonous, commanding.
15. *Voice Accent:* Foreign, western, southern, eastern, Bostonian.
16. *Fluency:* Hesitating, slow, measured, rapid, fluent.
17. *Expression:* Ungrammatical, slangy, correct, elegant, refined.
18. *Presentation:* Diffuse, extended, concise, terse, epigrammatical.
19. *Presentation:* Hazy, involved, connected, clear, vivid.
20. *Style:* Vulgar, coarse, ordinary, pleasing, courteous.
21. *Speech:* Blustering, whining, earnest, persuasive, convincing.
22. *Public Speaking:* Frightened, awkward, dull, oratorical, clear.
23. *Story Telling:* Pointless, wandering, fair, good, excellent.

III. Education and Scholarship, Including Written English

24. *Spelling:* Bad, poor, medium, good, excellent.
25. *Punctuation:* Bad, poor, medium, good, excellent.
26. *Expression:* Careless, illogical, incomplete, well considered, accurate.
27. *Handwriting:* Illegible, readable, good, businesslike, copper-plate.
28. *Typewriting:* None, slow, fair, rapid, high-speed.
29. *Mathematics:* Bad, poor, medium, good, excellent.
30. *Languages:* Impossible, slow, fair, good, quickly acquired.

31. *Conversation Preferred:* Gossipy, frivolous, news-of-day, sports, scientific.
32. *Reading Preferred:* Short stories, latest novels, good literature, classics, technical.
33. *Daily Papers:* Never-read, glance-at, read headings, examine, devour.
34. *Magazines, Popular:* Never-read, glance-at, read headings, examine, devour.

IV. Ability in General

35. *Thought:* Dull, confused, slow, rapid, brilliant.
36. *Thought:* Inaccurate, illogical, obscure, clear-cut, logical.
37. *Industry:* Lazy, fair, active, industrious, zealous.
38. *Imagination:* Bad, poor, medium, good, excellent.
39. *Memory:* Bad, poor, medium, good, excellent.
40. *Power of Concentration:* Bad, poor, medium, good, excellent.
41. *Common Sense:* Bad, poor, medium, good, excellent.
42. *Practicability:* Bad, poor, medium, good, excellent.
43. *Foresight:* Bad, poor, medium, good, excellent.
44. *Versatility:* Bad, poor, medium, good, excellent.
45. *Accuracy of Observation:* Bad, poor, medium, good, excellent.
46. *Technical Ability:* Bad, poor, medium, good, excellent.
47. *Sense of Responsibility:* Bad, poor, medium, good, excellent.
48. *Artistic Taste:* Bad, poor, medium, good, excellent.
49. *Emotional Control:* Bad, poor, medium, good, excellent.
50. *Poise:* Bad, poor, medium, good, excellent.

V. Business or Financial Aptitude

51. *Attitude:* Antagonistic, indifferent, vague, interested, eager.
52. *Punctuality:* Always late, uncertain, fair, on time, ahead.
53. *Habits:* Offensive, careless, neat, orderly, painstaking.
54. *Tact:* Rude, indifferent, fair, attractive, diplomatic.
55. *Self-reliance:* Timid, diffident, manly, confident, bold.

56. *Initiative:* None, small, active, energetic, aggressive.
57. *Persistence:* Easily discouraged, short-spurts, enduring, tenacious, dogged.
58. *Luck:* Unsuccessful, unlucky, successful, lucky, fortunate.
59. *Loyalty:* Self-interest, time-serving, indifferent, faithful, devoted.
60. *Reaction to Criticism:* Touchy, disputatious, agreeable, sympathetic, appreciative.
61. *Reaction to Advice:* Resentful, indifferent, receptive, desirous, eager.
62. *Friendliness:* Quarrelsome, dissents, reciprocates, congenial, fraternal.
63. *Life Insurance:* None, interested, small, good, large.
64. *Business Experience:* None, small, fair, good, large.
65. *Executive Ability:* None, small, fair, good, large.

VI. Moral, Social, and General Characteristics

66. Atheistic, skeptic, agnostic, liberal, orthodox.
67. Scoffing, indifferent, lukewarm, religious, devout.
68. Intolerant, conservative, receptive, tolerant, broad-minded.
69. Reactionary, conservative, moderate, radical, progressive.
70. Quarrelsome, contentious, quiet, pacifying, conciliatory.
71. Harsh, unkind, just, kind, sympathetic.
72. Obstinate, strong, firm, weak, yielding.
73. Dissipated, lax, temperate, restrained, ascetic.
74. Prudish, modest, conventional, unconventional, bold.
75. Dishonest, deceitful, sincere, truthful, honest.
76. Tricky, unreliable, honorable, reliable, conscientious.
77. Grasping, selfish, just, liberal, generous.
78. Envious, jealous, suspicious, guarded, trustful.
79. Secretive, reserved, direct, frank, talkative.
80. Listless, inattentive, receptive, attentive, alert.
81. Domineering, organizing, self-willed, cooperative, docile.
82. Irritating, abrupt, direct, cautious, tactful.
83. Discourteous, cold, formal, courteous, cordial.
84. Negligent, inconsiderate, respectful, considerate, deferential.

85. Pessimistic, discontented, judicial-minded, enthusiastic, optimistic.
86. Morose, gloomy, good-natured, cheerful, fun-loving.
87. Shrinking, bashful, self-reliant, forward, aggressive.
88. Lazy, indolent, active, energetic, strenuous.
89. Wasteful, shiftless, provident, miserly, thrifty.
90. Cowardly, timid, cautious, courageous, foolhardy.
91. Aristocratic, snobbish, careless, discriminating, democratic.
92. Servile, submissive, reserved, contented, ambitious.
93. Outspoken, self-willed, impatient, patient, tractable.
94. Uncertain, vacillating, hesitating, ready, persistent.

VII. Habits and Associates

95. *Physical Exercise:* None, occasional, moderate, frequent, systematic.
96. *Use of Tobacco:* Abhor, none, occasional, frequent, persistent.
97. *Profanity:* Abhor, none, occasional, frequent, habitual.
98. *Society Sought:* Low, indifferent, fair, good, elevating.
99. *Associates:* Agitators, radicals, neutrals, optimists, conservatives.
100. *Organizations Preferred:* Social, fraternal, literary, scientific, religious.

COLLATERAL READING

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Hotchkiss and Kilduff: "Advanced Business Correspondence," chap. VII, pp. 183–218. Harper and Brothers, 1921.

E. J. Kilduff: "How to Choose and Get a Better Job." Harper and Brothers, 1921.

D. W. Mead: "Contracts, Specifications, and Engineering Relation," chap. II, pp 16–34; par. 7–12; chap. VI, pp. 100–106, par. 56–58. McGraw-Hill Book Company 2nd. ed., 1920.

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How Practicing Engineers May Sell Their Services. *Engineering News-Record*, vol. 88, no. 13, pp. 523–524. March 30, 1922.

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F. R. LOW: System in Hiring Help (Editorial). *Power*, vol. 55, no. 9, p. 354, Feb. 28, 1922.

"Language for Men of Affairs," vol. I, chap. II, pp. 33–35. chap. XV, pp. 302–322 The Ronald Press Company, 1920.

CHAPTER X

WIRE COMMUNICATIONS

All manner of business in the engineering profession may be handled quickly, and with as much accuracy, usually, as in the business letter, by telegram.

The main offices of engineering companies use the telegram: (1) To give directions to the service men in less time and in less space than in the letter of directions; (2) to send directions and explanations to customers; (3) to quote figures and terms to prospective customers; (4) to explain delay in filling orders; (5) to make appointments for their service men and their representatives, or conference arrangements with their board of directors or their experts; (6) to secure quickly, from branch offices and remote plants, verification of data already submitted or further information on some point. Of course, the information sent for is such as can be quickly and accurately presented in concise, brief form. The telegram can hardly be expected to handle adequately the transmission of detailed information which needs extended investigation and complete and detailed discussion. Sometimes, however, even this may be transmitted in a long telegram. In such instances, the need for speed in getting the material to the main office or to the client makes length and the cost insignificant. These are some of the most frequent uses of the telegram by a business organization. The telegram bills of any company are always recognized as a very legitimate item of the overhead expenses, as well as a profitable investment.

The representatives of the large companies in the branch offices and on the road, the superintendent of the remote power plant, the investigator, the service men, also use the telegram to send in to the main office from day to day, or at other stated periods, progress reports on sales, prospects, conditions, findings and type of service rendered. Every prospective engineer or technical man will find a knowledge of what to include, how to organize and how to present material in a progress report telegram decidedly to his advantage. It is frequently one of the first means whereby he may call attention to his existence. It indicates his handling of the situation for which he has been made responsible. This result will hold true whether it is the executive of the branch office who sends in the progress report telegram or the cadet engineer out on his first job, doing his first bit of investigation, or running his first acceptance test.

For the benefit of the public, the telegraph company offers four different classes of service:[1] (1) The full-rate expedited telegram which may be sent either day or night. (2) The night message. (3) The day letter. (4) The night letter, very much used by the business man. The night letter is popular because it is usually delivered in time for the opening of business the next morning.

In most offices, the practice is to place the telegrams on the executive's desk in the most prominent position, either in a separate pile or on top of the letters. Telegrams, therefore, take precedence over letters. As a result, there are often times when it is more desirable to send a telegram than to write a business letter. This is especially true if the sender wishes to have his message get special attention or focus the attention upon himself.

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[1] See detailed description of *Classes of Service* on the back of the Western Union Telegram blank.

A great many senders of telegrams, especially the inexperienced, often sacrifice clearness to cost. The ten-word unit of the expedited message, for instance, unduly restrains and restricts them. The telegram has become a vehicle for the transaction of modern business because of its speed in reaching the second party of a transaction. Yet speed of delivery is of no value if the message is not accurate and clear. Clearness and accuracy, therefore, are of primary consideration in the telegram, not the number of words nor the cost. The writer of a telegram should take all the words he actually needs to make the message perfectly clear to the recipient, and to protect himself from misinterpretation. But the mere number of words he uses in his message does not always have a direct relation to the clearness of the presentation of the idea to the recipient. Few words are frequently as clear, often more clear, than many. Ten words may be more significant and clear than fifteen. The basis for choice of words and the number of words depends not upon the cost but upon the productive power, the carrying power, of each word selected.

Conciseness should not signify few words as much as it should suggest the using of each word to its limit of elasticity—that is, the selection of the word that will carry the heaviest load with the greatest factor of safety. While the sender of the telegram should probably have a limit to the number of words he plans to use in his message before he sets it down, he should keep his attention centered upon the clearness of the message which he is writing, not on the number of words he is using. When he revises his message, and tests it, he should test, first, for clearness, then count the number of words that have been necessary to give this clearness. The standard should be clearness without the need for any marks of punctuation. If punctuation marks are necessary, the sender must remember that the telegraph company regards them and counts them as words, for they require the same handling in transmission as words. The sender of the telegram, therefore, who wishes punctuation included, must indicate his desire at the time he presents his message for transmission and spell out the punctuation marks. The better plan, however, is so to phrase the message that clearness does not depend upon punctuation. When the sender overlooks clearness, he lays himself liable to misinterpretation and costly errors.

In addition to the selection of the requisite number of the words, there are other details about the presentation of the message that help to make for clearness. These details are the careful analysis of the situation that requires the telegraphic communication, the selection of the pertinent material, the organization of this pertinent material for the salient points, and, finally, the actual phrasing of the message to include and present clearly these points to the recipient. Too frequently the actual writing of the message on the blank seems of first importance, hence the frequent lack of definite meeting of the situation and the attendant lack of clearness. Too much stress cannot be put upon the need of a careful analysis and survey of the points at issue, the selection and organization of the necessary material. There should be a complete understanding of what the situation involves, and knowledge of how to present skilfully the underlying idea in clear yet concise English. The method, rightly used, demonstrates that the sender has his sense of proportion and of relative values, can get an impersonal view upon his manner of presentation, and understands the "you" attitude. He should train himself to write his actual message *last* not *first.*

Most large companies have their messages typed and checked before the messenger is called. The general practice is to have three copies of the message: The original, which goes to the telegraph office for transmission and filing in the office file, and two carbons. One carbon is for the files of the sender, the other for the recipient. The carbon for the client is slipped immediately into an envelope and sent through the mail. This is to check the message which the telegraph company delivers or telephones. In case of dispute, the carbon of the message may be used to set matters right. Sometimes a letter accompanies the carbon. More frequently, however, the carbon alone is sent. The letter may be written two or three days later or may not be considered necessary.

As far as possible, simple, familiar words should be selected for the message of the telegram. Though telegraphers do their best at sending, they cannot be expected to handle unfamiliar and rare words as easily and as skilfully as those in constant, common use. It is not conducive to clearness to introduce long, pedantic words. Simplicity in diction in any profession is always in good taste, always effective, and always advantageous.

The following telegrams meet the requirements:

Twelve-inch valve ordered November fifteenth not received. Your acceptance of our order promised by December first. If you cannot furnish it by December twenty-fourth cancel order. Wire reply.

Turbine in bad condition. Back pressure twenty pounds too high. New main and truck bearing needed and ordered from Babcock today. Am repairing engine and will have running in ten days.

The telegram, therefore, is a form of business communication which the engineering student can study and use to good purpose. It requires that he have a grasp of the idea which he wishes to convey, so that he can present it in concise, clear form. It demands extreme regard for the "you" attitude.

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THE TELEPHONE

The telephone is also a means frequently used by business men to hasten action. Both local and long-distance business may be transacted by telephone. It is not, however, so satisfactory and final a means of transacting business as either the business letter or the telegram. There is greater danger of misunderstanding and of lapses of memory. There is no record to file for possible future reference. Every telephone transaction, to be water-tight, must be followed by a letter of confirmation. But for giving directions, making appointments, getting information locally, the efficient use of the telephone is indispensable.

The telephone companies have spent much time and effort in making their service prompt, efficient and courteous, but oftentimes the user of this service does not do his part. He is brusque, impatient, ill-tempered and discourteous. Every one, of course, recognizes that the telephone is a tool for business. It should not be misused during business hours for social purposes. In answering a telephone call, time is saved and misunderstandings are avoided if the listener will give immediately his name or that of his department or both, depending upon his position in the special department. For instance, "A. C. Jones, Sales Department," or if one telephone handles all the requirements of a man's business, then the telephone number, as "Chelsea 1251."

The listener or the sender of the telephone message should never try to carry on two conversations—one over his desk and one over the telephone—simultaneously any more than he would try to write two letters at one and the same time. He cannot give full attention to either situation. He is also likely to make the man at the other end of the line ill at ease, if not suspicious, for the latter can never be sure that the side remarks are not reflecting unfavorably upon him. Besides the discourtesy, there are possibilities of suggesting that a man does not regard the affairs of each of his clients as confidential.

When the engineer undertakes a business transaction by telephone, he should analyze the situation as carefully, organize it as definitely, and execute it as skilfully as he would his telegram or his business letter. Conciseness, clearness, and courtesy are the most important requisites of the telephone. Though there may seem absolutely no likelihood of the matter being misunderstood, it is always best to confirm the verbal agreement in a letter which begins in some such manner as this: "Confirming our telephone conversation of May 26 concerning my report upon the Bates Road, etc." This approach suggests the reason for the letter. It is a matter of record and should, therefore, state all the details that are necessary for a clear understanding of the situation under discussion. There is no need, however, to stress the attention-getting qualities of the opening sentence or paragraph. Accuracy of statement should have first consideration.

COLLATERAL READING

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CHAPTER XI

THE ORDER LETTER

The order letter is dependent for its success more upon the display and layout, and upon accuracy and accessibility, than upon the tone that gives the "you" attitude. The items for this letter are: (1) Name of article wanted, description, catalogue number, quantity, price; (2) method of delivery; (3) terms; (4) time of shipment or delivery; (5) shipping-point address.

Frequently, it is not necessary to write a letter. Large companies have found that a well-planned order blank expedites the filling of orders. There is no reason whatever for the engineer's writing an order letter if he can make the order blank fill his need. In fact, it sometimes seems better not to write the letter. It often causes confusion. Some companies which do a large business by mail have this general direction which is well worth regarding:

> Use our blank and fill in under each heading completely. Send a letter also, if you want to, but use our order blank.

Frequently, when the letter also is sent, it is for the purpose of recording the order.

The order letter is most frequently used by the engineer to send personal orders for professional and cultural books and small pieces of equipment. The order that involves much money and large and extensive equipment is usually handled directly through the personal representatives of large industries. There is no reason, however, why, under the proper circumstances, large and important as well as small and personal orders might not be handled by mail.

An order blank, for which the engineer seems to have frequent use, is not concerned with the ordering of material for which he writes his check, but with sending for bulletins, books, and catalogues upon equipment and methods. Every technical magazine has several of these blanks in every issue. These various order blanks follow, in the request, the regular and conventional form of the usual order letter, but they give more prominence to the name of the person who fills out the blank than to the thing asked for. Of course, as these blanks are one means of getting a list of interested prospects for the companies, the name, the position, the company, and the address of the engineer are quite as important to the companies who use this type of blank in connection with their advertisement as the order for the special bulletin or catalogue. Generally, no price is mentioned, as in the book blanks. The detailed information asked for on the usual blank seems evidently for the files of the advertiser.

Publishing companies frequently facilitate the handling of their orders, as well as invite ordering, by issuing, in the technical publication, *a free examination coupon.* All the customer needs to do is to fill in the blanks and return the slip. The exact title of the book or books, the terms of payment, the shipping directions, are all included as on the regular order sheet. This method simplifies the handling of the order by the publishers as well as makes ordering easy for the engineer. The specifications and terms of purchase have been worked out for him. After he has read the message on the blank for the terms of the agreement, he has only to fill in the spaces for identification and reference.

Another means used to make ordering easy and attractive is to include a self-addressed postcard in with the advertising matter. This card usually has a carefully worked out message similar to that on the order blanks just described. A study of all the various kinds of blanks as they appear in the different magazines is not only interesting but profitable.

While these order blanks belong, of course, with the advertising campaign of various companies, their use by the engineer in place of the letter gives them a place in the discussion of the order letter.

When, however, there are no shortcuts to ordering, the order letter should be as clear, definite, and accurate in all details without the order form as with it. In fact, if the engineer will follow, as far as possible, the layout of the blank, he will facilitate greatly the handling of his order. This is a good layout to keep in mind:

Catalogue no. . . page. . . quantity. . . article. . . price. . . Total. . .

Of course, this plan assumes that the detailed facts are known.

It is good policy to indicate what figures were used to give the total amount for which the check reads, or, if there are to be terms of payment, to indicate, as some of the order blanks have done, the agreement as to terms. For verification and record, the writer should state at the beginning of his letter the exact amount which he has sent and the form in which he has sent it—check, money order, draft. There is less danger, too, of the check being lost or mutilated, when the letter is opened, if it has been attached by a clip to the upper left-hand corner of the letter. Loose checks sometimes stick in the envelope. They may not be noticed, if the writer has neglected to note in his letter the exact amount and the form. It is good practice always to attach the check to the letter or the order sheet. If there is no place on the blank to note how payment is made, then on the order sheet may be written somewhere "check enclosed for $." Very explicit shipping directions should be given. Nothing should be left to chance.

Accuracy, clearness, definiteness, and accessibility are the cardinal points for the order letter or its equivalent, the order blank.

COLLATERAL READING

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CHAPTER XII

THE LETTER OF INQUIRY

The letter of inquiry, often a letter of request, offers the young engineer an excellent opportunity to gain for himself a reputation for definiteness and conciseness of statement, and for desirable tone. Its effective handling is a challenge to any one who likes the stimulation which results from overcoming obstacles. It is a letter which may be used immediately by the technical student to get: (1) Technical catalogues; (2) information for carrying out some research or thesis problem; (3) inquiries to companies about the possibilities of a loan of equipment or material for running tests and collecting data; (4) requests for permission to use a person's name as a reference.

This letter of inquiry should be as brief and concise as is consistent with the presentation of the proposition or the subject of inquiry. It must cover a statement of all the facts. It should be direct and straightforward, so as to leave no doubt as to its validity. It should give briefly the circumstances which prompted the inquiry. For instance:

The subject for my thesis, required for graduation at Ohio State University, is Automatic Signals.

Or:

I am making an investigation of boiler scale in connection with a course in steam-power plants here at Ohio

State University under the direction of Professor C. R. Naylor.

Either of these suggests not only the circumstances, but also a person, as sponsoring the inquiry, if not directly responsible for it. It suggests, too, that he will vouch for the student's reliability for handling and caring for equipment and for making good any losses. When the instructor's name is used with his full knowledge and sanction, the student gets attention that he can hardly expect to get on his own name. The same rule, of course, applies for the use of references in the letter of inquiry as in the letter of application. In both instances, good ethics as well as courtesy demand getting the permission of the referee.

F. R. Low, in a recent editorial in *Power*, makes this comment, which is extremely pertinent to the present discussion:

> If, in asking for information or a catalog, the engineer writes on a postal card or "store stationery," giving his home address, his request may meet with little attention, especially if the catalog is of some value or the furnishing of the information desired involves some trouble and expense.
>
> The advertiser, unable directly to identify the inquirer with some desirable position and a prospective sale, gives it scant attention. He does not want to lumber up his prospect list with names of which he does not know the meaning, or be playing a line at the other end of which a wily competitor may be playing pranks. The probability is that a note explaining the conditions would have resulted in a personally addressed letter. Advertisers are glad to supply information regarding their wares for engineers' files, but it saves them expense and embarrassment if the

request makes it evident that it is only the information that is at present desired.[1]

In connection with the identification of the writer, it might be well to comment upon the use of the letterhead of a firm by an individual employee. Its use by the individual employee has the same effect upon the addressee as the naming of a reference. If the employee has easy access to the correspondence sheets of the company, then he has the responsibility of using his freedom fairly. He ought to make sure that in gathering prestige to himself through the statements he makes presumably with the company back of him, he will not in any way compromise or reflect unfavorably upon the company. For his statements are bound to have more significance if apparently sponsored by the company; and if the addressee should be able to add to his prestige or earnings through reference to correspondence with influential companies, he will naturally not be averse to doing it. Sometimes, real harm is done by thoughtless, if not unscrupulous, use of company stationery for private projects. Organizations which employ engineers are quite naturally insistent upon the accuracy of their facts and figures. They must be. Their success depends upon them. For his own future, the young engineer ought to use company stationery for personal business with extreme care. It would be better and much more businesslike for him to purchase for his personal use his own business stationery, made up under his direction with only his name and address in the letterhead.

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[1] F. R. Low: Editorial. *Power*, vol. 56, no. 1, July 4, 1922.

The explanation of just what information is wanted should be worked out with extreme care. Sometimes it can be put in a few words; sometimes it may require several sentences. Extended explanation seems necessary if the inquirer is limiting himself to the study of one phase of a large subject. Vague inquiries make for unnecessarily extended correspondence and delay. The engineer should aim for the same exactness in the statement of his request as in the statement of his specifications. To facilitate handling and to get the exact information he should be explicit and definite in his statement of what he wants.

The matter of tone is often overlooked in this letter of inquiry. Frequently, the inquirer takes for granted that the information is rightly his, and that he is under no obligation for the time and effort a company takes. Giving information means profits to them. True, it generally does; yet this fact does not excuse the writer of any letter of inquiry from failing to observe the courtesy of good business. It does not warrant making bald, brusque requests that convey the impression that the addressee owes the writer the information. While this impression may not actively antagonize, it gives a decidedly negative suggestion and is not likely to bring forth the generous response that the courteous request does. The other extreme of too humbly requesting, often suggested by statements such as "I am taking the liberty to inquire," or "I take this liberty of asking if you are willing that I should place your name on my reference list," are, however, just as undesirable as the too brusque inquiry.

A self-respecting request, a matter-of-fact proposition, which suggests taking advantage of a privilege, yet conveys by the general tone—not by the actual wording—the appreciation of service about to be rendered, reacts most favorably upon all concerned. For example:

> I am writing for a position in the estimating department of the American Bridge Company. May I refer to you as one of those who know of my work and my ability?

In connection with expressing appreciation, the accepted practice seems to be this: If the result of the letter of inquiry is to benefit a group, not the individual inquirer, then a closing paragraph in which some natural and easy expression of appreciation for any service that the addressee can render is sufficient. If the result of the inquiry benefits the inquirer alone, then he writes a letter of thanks after the reply has been received. An engineering student, for instance, should always acknowledge by a letter the answer to his inquiries. It is always good business. This acknowledgment should be direct, straightforward, simple, and courteous. The engineering student who can write a good letter of acknowledgment often attracts favorable attention from the influential executive.

The stamp for a reply should be enclosed if the writer alone will profit. It may be omitted if the inquiry may lead to business relations by which the addressee will profit. "When in doubt," directs one authority, "enclose a stamp, but do not attach."[1]

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[1] Bartholomew and Hurlbut: "The Business Man's English, p. 172 The Macmillan Company, 1921.

Loose stamps are preferable to self-addressed stamped envelopes, especially in large organizations. The stamped envelope which must be attached to the letter of inquiry, immediately after its opening, interferes, in a good many instances, with the actual routing through the office, and is a bother a great many times all along the line. Loose stamps, on the other hand, can be put aside for future use.

Oftentimes, the engineering student in his letter of inquiry has nothing to offer in return for a company's compliance with his request. Yet his requests are granted with amazing frequency, because he is usually considered as a potential prospect for future business dealings. But there are times when the student can offer immediate returns for the service rendered. Where a request is being made for equipment and material for tests, for instance, he can offer the results of trial runs, data sheets, etc. If his observations and tests can be accepted as reliable—and no student ought to make this offer of results unless he feels confident in his own mind that he will gather his facts with all the extreme scientific accuracy of which he is capable—then the organization can directly profit by granting his request. Usually, however, companies look for the indirect rather than the direct returns when they render service to student inquirers.

The engineer may use the letter of inquiry to get information; that is, to get catalogues and other material which a company may have for distribution, or compilations specially made, and for seeking the loan of equipment or material for engineering investigation. He may also use it to secure information concerning the advisability of using a certain type of apparatus or a certain method of construction. Large organizations which serve engineers frequently maintain an information department, the sole purpose of which is to handle the inquiries that may come concerning the use of their products. The advertisements of engineering corporations in any of the technical publications will indicate how they seek inquiries concerning their materials or service. Even a student, if he explains the purpose of his inquiry, may benefit by this information department.

A letter of inquiry that is too frequently neglected is that in which the engineer writes his former superior or his college instructor for permission to use his name for reference either for a position or for membership in one of the professional societies. Yet the willingness of the superior or the professor should not be taken for granted. It should be asked for as concisely and as courteously as possible. The request should observe the amenities and the personal yet dignified tone.

The letter of inquiry, therefore, may be used by the engineer for the following purposes:

1. In writing for technical catalogues.
2. In writing for information for thesis or research. This would include inquiries for all information that can be of service to an engineer in his profession or in his technical studies.
3. In writing for information on the advisability of using certain equipment or method of procedure, or concerning the opportunity for opening in professional work.
4. In writing for permission to use a person's name as a reference.

One great advantage of the study of the letter of inquiry is that its possibilities may be immediately tested by the engineering student.

The letter of acknowledgment or commendation—in passing—needs brief consideration so that the engineer may escape some of the undesirable results that sometimes arise from it. Generally speaking, it is better to write a fairly non-committal letter of acknowledgment than to become enthusiastic in statement and say too much. Oftentimes, what a man has written in a burst of enthusiasm concerning his first trial of a certain method, a certain material or equipment, he has cause to regret later. Further investigation may not bear out his first estimate; organizations occasionally use these enthusiastic letters of acknowledgment in their advertising. Some organizations make a practice of underscoring in every letter which they receive, irrespective of its immediate purpose, the statements that would make good talking points for their business. They do not generally use these favorable statements verbatim or identify them without asking permission of the writer. Yet they are always, quite naturally, looking for these favorable comments in all the letters which they receive. When the name of the writer is attached, these comments, obviously, gain certain prestige.

It is, of course, not unnatural for organizations to make use of all the favorable comments which come to their attention. Indeed, there can be no objection to the right use of them. The caution to the engineer is that he bear in mind the possibility of his favorable comment getting publicity, and that he give his letter of acknowledgment careful scrutiny with this point in mind: Would I like to see this printed and signed with my name and scattered broadcast as advertising ammunition for .... company? This challenge of what he writes does not avoid giving praise where it is merited; it makes only for discriminating and guarded comments. It makes sure that a man is willing to stand back of what he puts in writing. The simple letter of acknowledgment in which the engineer merely says "Thank you" does not, of course, require this caution. It rather requires sincerity, emphasis, and conciseness and courtesy. One sentence is usually better than three or four sentences:

> Thank you for the catalogue and descriptive material which you recently sent me concerning your tests on the Corliss engine

represents the simple acknowledgment of the service rendered. If, however, to this letter given above, something more is added, then the formula suggested above under the question, "Would I like to see this printed, etc.," must be applied. It is interesting to note the change when the letter reads thus:

> Thank you for the catalogue and descriptive material which you recently sent me concerning your tests on the Corliss engine. They will be of great assistance to me in my work, and *I consider them also valuable additions to the present daia upon this engine.*

Statements like the one italicized run the danger of saying too much.

The fact that the engineer should use discretion in the letters of acknowledgment which he writes should not, however, deter him or make him neglect those for which the occasion calls. He should acknowledge favors which others do for him and commend the professional achievement of his colleagues in a simple, direct, sincere letter. It is worth the effort every time.

On each separate occasion where the need arises, even when permission can almost be taken for granted, the engineer should always make the request cover the individual case and should always acknowledge any service immediately. The note of acknowledgment, too, should be a simple, concise, informal one.

COLLATERAL READING

BARTHOLOMEW and HURLBUT: "The Business Man's English," pp. 171–173. The Macmillan Company, 1921.

HALL: "Handbook of Business Correspondence," sect. XXX, pp. 912–921. McGraw-Hill Book Company, 1923.

SYPHERD: "Handbook of English for Engineers," p. 120. Scott, Foresman and Company, 1916.

CHAPTER XIII

THE LETTER OF INSTRUCTION

When the young engineer has become skilled in his work, he may be told to give directions, instructions, or explanations to a newcomer or some one unfamiliar with his particular work. It may be his helper, a man perhaps with only practical experience. It may be a younger technical college man. It may be a customer or a client.

The aim of instructions is generally to transmit information to another person concerning the method of operating, of using, of adjusting his own skill or engineering materials so as to produce the action and the result desired by the person giving the instructions. Skilful giving of instructions requires:

1. That the instructor know the demands of the work sufficiently to rate results fairly.
2. That the instructor know his men sufficiently to estimate their efforts, to understand their attitude, and to interpret tactfully the proposed work into terms that they can understand and execute.

Only with this knowledge of the work and of the men can the instructor hope to accomplish the results he proposes. The new definition of engineering, which is

> the science of controlling the forces and of utilizing the materials of nature for the benefit of man, and the art of

organizing and of directing human activities in connection therewith[1]

stresses the engineer's need for knowing both.

The use of intelligible terms and the maintenance of a tolerant attitude are characteristics of good instructions. The good executive knows how to give clear and workable ones. He does not decide that those whom he directs are unable to execute instructions until he has made sure that he has done everything in his power to transmit the necessary information.

Giving instructions verbally is much easier in some ways than in writing. But instructions in writing have the value of the record as well as the check they make upon the one who issues the orders. It is a significant fact that train orders are always in writing. In some business organizations, practically all instructions and orders to be official must be in writing. The extent to which this method is used varies in different organizations.

In large organizations, the young engineer has cause to write letters of instruction only on rare occasions. But if the organization is a small one, there is more opportunity. A young engineer, recently graduated, for example, on his first work after college got out simple instructions for the field representatives on report writing. These instructions which he took time to make out brought him immediate commendation. There are often opportunities open such as this which, if the young engineer grasped, would give him practice in the art of transmitting his information to another. Of course, the written instructions can be used most effectively with those men who are accustomed to getting information through the written presentation. For illiterate men, written instructions are of little value. The written instruction, therefore, presupposes a certain amount of education and ability to acquire information from the written page. In some instances, it will be recalled, the oral and written methods are combined to give double security. For instance, verbal directions are usually given for any laboratory experiment; and at the time of the actual experiment there are written instructions in the manual to follow.

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[1] Federated American Engineering Societies Preamble.

The opportunity for writing letters of instruction is not likely to come early in the professional experience of the engineer. They become of increasing importance, however, as his responsibility and executive duties widen. The letter of instruction is, in fact, one of the letters of an executive. The addressees may be subordinates of the company, representatives in branch offices, operators in the plant and in the service stations, erectors of machinery, factory heads, and so on. Or they may be customers, consumers, and clients. Naturally there is a difference in treatment and tone for the two types of addressee.

Before taking up these matters of treatment and tone, however, it is desirable to consider the requisites of the instruction letter that are common to both types of addressee. For both, the "you" attitude is the first consideration. The writer must be able to appreciate the state of mind, the knowledge, the information of the person receiving the instruction, as well as his relation with the work. The subordinate in the plant, for instance, knows more about the mechanical details of the turbo-generator than does the manufacturer who wants one installed in his plant. The manufacturer knows more about plant conditions and is influenced by the expense of installation where the subordinate is not. The writer, therefore, must keep in mind the fact that, though he is giving instructions on the same thing, the interests and aims of the two men are quite unlike. He must try to see the turbo-generator from two different points of view. If he is dealing with subordinates with technical education, he must remember how the details looked to him when he was in their position. He must understand, also, what the demands of the manufacturer are. The "you" attitude should make for clearness of statement. It should make for definiteness.

In discussing the value of instruction books for machinery, J. A. MacMurchy, in a recent article in *Power*, makes this comment, which is as applicable to the letter of instruction as it is to the book of instructions:

> It is much easier to say how instruction books should be written well than it is to get them written, for manufacturing concerns seldom have anyone in their organizations who is qualified to write an instruction book. The engineer who designs and is responsible for the apparatus usually has this duty delegated to him on the general ground that he should know more about the apparatus than anyone else. However, a man may be a good engineer, and yet be a poor man to write an instruction book, for merely understanding the machine is by no means sufficient qualification for this duty. The person who writes an instruction book should be able to put himself in the place of the operator and see things from

the latter's point of view, but unless he has been an operator himself, it is rather hard to do this. An engineer is likely to suppose that everybody knows as much as he does, and that the operator is not any more liable to do a foolish thing than he would. Again, his language may be somewhat technical and may not convey to the man who reads the instruction book the exact shade of meaning that the engineer had in mind.

In writing an instruction book it is desirable that the language used be as simple as possible and at no time should it be capable of having two meanings.[1]

Instructions must be related definitely to one particular work or type of work and must be for one group of worker or user. There will be as many variations in instructions as there are different groups of people to execute them. The presentation must be so phrased that the relationships are clear and intelligible. For this reason, there is usually need for extended details and explanations of any point upon which there is the least danger of misunderstanding and misinterpretation. It is better to err on the side of too much emphasis of salient details, too much explanation, than of too few and too little.

In giving full details, the tone and the attitude should not be patronizing. They should be designed to convey a sincere desire to make advantageous suggestions. There must always be unity in the instructions; that is, as far as possible, to avoid confusion, one phase or one set of directions should be completed before another is undertaken. The maintaining of this unity will demonstrate to the executive how well he has the idea in his own mind. Vague thinking on the part of the executive frequently results in vague and inaccurate execution of instructions on the part of others. Of course, there are times when the results must be based upon the trial-and-error method. Then the inaccuracies and the failures in results are not due to vague instructions, but to some flaw in the hypothesis upon which the executive based his instructions. There are times when instructions are left purposely vague in order to try the mettle of the subordinates. Generally speaking, however, instructions should be definite and easy to understand. Yet instructions may come up to standard in every particular, and still be ineffective, if the executive has not gained the good will, the confidence, and the loyalty of his men, or if the subordinate is not in the right work.

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[1] J. A. MacMurchy: Instructing Power-plant Operators. *Power*, vol. 55, no. 7, p. 261, Feb. 14, 1922.

To subordinates, and to technical men, in addition to the general requisites already mentioned, the instructions usually have a conciseness which would be entirely out of place with the non-technical man. They use also the technical language of the particular work—the trade terms and the code that would be unfamiliar and unintelligible to an outsider. This technical language often makes possible much compression and noticeably shortens the length of the letter. It assumes, of course, intimate knowledge of the business on the part of the executive and of the subordinate or the technical man. Definiteness in this connection is, if anything, of more importance than detailed explanation. He knows the code. The desired combinations are what he wants.

To customers, consumers and clients, in addition to the general requisites, the tone and the language must be markedly different from those for the technical man. No familiarity on the part of the client with the code language of the profession can be assumed by the writer. He must, therefore, select terms and words that would be easily intelligible to the person with average general knowledge. He must "step-down" the code into a form that is clear to the uninformed man. This requirement makes for a longer letter to the client, comparatively speaking, than to the technical man. Complete and explicit directions have to be given; painstaking explanations are demanded. Frequently, in fact, the successful operation of equipment depends upon the detail and care with which the expert gives specific directions to the users. The tone is appreciably changed, too, because of the difference in relationship. Here it is the assumption of a desire on the part of the client to know, for his own profit, and suggestions on the part of the writer for the successful culmination of the instructions which he is giving if they are explicitly followed.

The letter of instruction, since it is a means of directing the human element concerned in the engineering profession, is important for the engineer. It is the letter for which he has late use It is, however, one which is worth consideration and practice in college. There is no better way of getting a clear understanding of what the "you" attitude really signifies than by practice in giving instructions on the same matter to persons whose background, training, and interests are radically different. Good practice can be gained in the advanced technical college work if the student has the opportunity to be foreman on some advanced laboratory experiment. Here he must divide the work, and assign it, as well as "issue" instructions concerning the duties of different members of the group. Another way of testing one's ability to give instructions is by explaining the method of carrying on a complex laboratory experiment to a student who was absent at the time the instructor gave the directions to the class. These directions would probably be given orally, of course, but this oral presentation in no way alters the fundamentals underlying the issuing of good instructions.

The letter of instruction can make vivid, in a way that nothing else can, the need of the writer's understanding and conversing, without talking down to the person whose whole outlook and aim are different. And it is more frequently hard to issue instructions to equals than to subordinates. The writer runs the risk of taking too much for granted, of being fearful that he will say too much that they already know or will reflect upon the intelligence of his clients by keeping his language too simple, his explanations too full, his details too numerous. Details—significant details, of course—details that are limited to the case in point—are the only ones that are necessary. All others should be eliminated. The standard for the good letter of instruction ought to be the same as that for a good road map or of a well-marked automobile road—even though there must be detours, they are so well marked and the directions are so explicit that if the tourist reads carefully and follows the directions, he will neither waste his time nor lose the way.

COLLATERAL READING

Sypherd: "Handbook of English for Engineers," pp. 115–120. Scott, Foresman and Company, 1916.
Watt: "The Composition of Technical Papers," pp. 407–408. McGraw-Hill Book Company, 1917.
"Individual or Group," *Engineering News-Record*, vol. 89, no. 6, p. 217, Aug. 10, 1922.
"A Responsibility of Leadership," *Engineering News-Record*, vol. 89, no. 7, p. 259, Aug. 17, 1922.
"A Word for the Chief with Faith in his Men," *Engineering News-Record*, vol. 90, no. 6, p. 270, Feb. 8, 1923; "A Necessary Quality," ibid, no. 7, p. 286, Feb. 15, 1923.
J. A. MacMurchy: Instructing Power-plant Operators. *Power*, vol. 55, no. 7, pp. 260–262, Feb. 14, 1922.
"Language for Men of Affairs," vol. I, Chap. XV, XVI, pp. 303–345. The Ronald Press Company, 1920.

CHAPTER XIV

THE SALES LETTER

Sales letter-writing has become a highly specialized form of business English. He who intends to use the sales letter extensively should make an intensive study of its technique. The engineer needs a knowledge of this letter, not so much to become proficient in writing the type so as to advance his own professional interests as to gain some knowledge of the standards for good sales letters. He can use his knowledge to rate those which come to his desk. Incidentally, he will be able to make some conclusions upon the person or the organization which sends him the sales letter.

Considered from one point of view, every business letter can be called a selling letter, for every business communication is for the purpose of effecting some definite action. The application letter, for example, is to sell personal services; the instruction letter is to sell a certain method of doing something; the letter of inquiry is to sell the idea that the answer would be profitable to the addressee, and so on. The type of letter, however, which is commonly known as the sales letter has a very distinct method, technique and purpose. It has been the subject of much study, because of its importance to direct mail selling. It is not necessary in the present discussion to go into all the intricate details of the technique. The engineering student who is interested can find adequate and satisfactory discussion in any of the books listed at the end of this chapter. The purpose here is to give the engineer only a working basis for judging sales letters.

The subjects of the sales letter which the engineer usually receives are financial investments—stocks and bonds—professional books, cultural courses of study and books, engineering apparatus and equipment, conveniences and comforts. Because of his desire to make up for the lack of cultural study, he is often susceptible to propositions which seem to offer opportunities to supply his lack A little study and analysis of the sales letters on the topics just enumerated will disclose to the engineer that each and all of these feature strongly the "you" interests. They aim to get the personal and individual point of view, and by this means appeal to the needs, desires, inclinations, and aspirations of the technical man.[1]

The first paragraph, the approach, has for its aim arousing the attention of the engineer and creating interest through the directness of the beginning and the immediateness of the use of the commodity. There is a wide appeal to the emotions or to the intellect.

The aim of the second division is to create desire and establish belief. To create desire, the special characteristics of the engineer or of the type of prospect which the engineer represents are emphasized and played, with the intention of making one of three appeals: (1) To his pride; (2) to his fear of loss; (3) to his eagerness for profit. Pride, for example, may be the appeal of the sales letter which is intended to sell an automobile or a cultural course in reading; fear of loss, the appeal of a limited time offer on the price of equipment; eagerness for profit, the appeal of the letter for investment in stocks and bonds. Examples of the use of these three appeals can be multiplied indefinitely by only a superficial scanning of current sales letters. While only one division really, this second usually includes more than one paragraph.

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[1] The characteristics mentioned in this paragraph and the divisions of the sales letter follow the discussion in J. B. Opdycke: "English of Commerce," pp. 219-233, Charles Scribner's Sons, 1920.

The third division is that devoted to getting resolution and action. It is not enough for the letter to create desire in the mind of the engineer and convince him that the proposition is based upon sound business principles. The third division must be so handled that he will not only resolve to benefit personally, but will also act at once upon his resolution. To get immediate action, special inducements are frequently offered that make use of all the appeals just enumerated. To make action easy, in fact to invite action, order blanks are enclosed that will demand the least amount of effort on the part of the prospect.[1] The urge to action is further stressed by the constant assumption throughout the entire letter that the sale is made. The attempt to speed up action by special inducements and the constant assumption that the sale is made are extremely excellent ones when used with discretion, sincerity, and naturalness. They are extremely bad, however, and probably lose more sales than they make, when they do not ring true, are undignified, have a puerile tone, or offer a ridiculous inducement Sometimes, indeed, inducements that seem an insult to the intelligence are offered a mature prospect. The best type of sales letter is one which gives the impression of a direct man-to-man proposition. This is the result of: (1) Sound business principles, (2) the writer's confidence in what he has to sell, (3) his emphatic and convincing presentation, (4) the balance of the different parts of the letter itself, (5) the personality and individuality—not the eccentricity—of the approach, and (6) finally, the directness of the appeal to the personal interests of the engineer.

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[1] See discussion of order blanks under *The Order Letter.*

This specimen letter is an example of the right kind of a sales letter:

Dear Sir:

Approach

Any improvement in your office that will help you increase the efficiency of your office force means a saving to you in dollars and cents.

Desire

The *Blank Patent Filing Cabinet* will save you both time and money. It is a complete and compact filing case that is simple and convenient. Instead of having your records scattered in several places around your office, you can keep them all together. In one place and in one file they are accessible for immediate reference.

Look on page 4 of the enclosed booklet for the special features.

Belief

The John Smith Company, The High Manufacturing Company, The Pioneer Bank, and H. B. Doe and Sons are among the concerns that use the *Blank.*

Resolution and Action

We shall be glad to give you prices on the size and style which you select. Fill out the enclosed postcard. We want to serve you.

Very truly yours,

Practice in sales letter-writing comes through any sales proposition in which the student engineer takes an interest while in college. For example, there are propositions of sales in connection with the publication of the technical college magazine for subscriptions, for advertising; in connection with membership campaigns of the student branches of the various professional societies; in connection with the business which a student may have as a means of livelihood during college. All these various activities offer excellent opportunities for the engineering student to increase his practice and gain insight into the strength and the weakness of the sales letter. Knowledge gained by this means is of extreme practical value to the engineering student later.

A common fault in sales letters is the ambiguity of statement that is intended to give the impression of reliability and unquestionable facts. The engineer with a mind trained to penetrate to the foundations of facts, to analyze and make reliable judgments, should apply these same scientific methods to the sales letters which he receives. His knowledge of English should be such that he can recognize vague, general statements that stop short before they make the underlying facts definite and exact. He ought to get the habit of reading shrewdly, so that he can recognize sentences that are full of tricks of presentation for exploiting a proposition, instead of sound, honest statements for one worth promoting and supporting. If he understands the technique of the sales letter sufficiently, he is not likely to be misled by attractively presented yet purposely vague sentences which exploit unsound propositions. This need for wisely judging cannot be too strongly emphasized. The good sales letter is the one that will, under all circumstances, keep the confidence of the prospect, and bring results.

COLLATERAL READING

Bartholomew and Hurlbut: "Business Correspondence," pp. 207-222. The Macmillan Company, 1921

Hall: "The Handbook of Business Correspondence," sec. IV; pp. 92–170; sec. XVI, pp. 561–580. McGraw-Hill Book Company, 1923.

Kitson: "The Mind of the Buyer." The Macmillan Company, 1921

Opdycke: "English of Commerce," pp 219-233. Charles Scribner's Sons, 1920.

Sypherd: "Handbook of English for Engineers," pp 122–123. Scott, Foresman and Company, 1916.

CHAPTER XV

DICTATION

Skill in dictation is of great service to the engineer. It saves time and it tends to keep the presentation of the fundamental thought flexible. While the case does not always hold, dictation seems to have more to do with the answering of correspondence than with the initiating of correspondence. The discussion of dictation, therefore, will be largely concerned with a study of the answering of letters. The initiating of correspondence can be managed under the same method and system. Dictation, in reality, is only a mechanical method of relieving the dictator from the physical labor of putting his ideas on paper. It is not oral discourse, however, since the ideas of the dictator reach the other person only through the written page. It is talking for writing—for seeing, not for hearing.

There are two methods of dictation which the engineer may employ:

1. He may dictate directly to a stenographer.
2. He may dictate to the transcriber by means of the dictating machine.

There are advantages in both methods. The stenographer may relieve the dictator of some of the minor details and aid him in some of the mechanics of the writing. The dictating machine, on the other hand, increases the dictator's output. He can dictate at odd moments between conferences and other duties, and at times when the services of the stenographer are not available. The dictating machine does away with a second personality of which every dictator is, more or less, always conscious and which, to some extent, always interferes with his concentration and his direct approach to that all-important person, the addressee. The dictator has the better opportunity to visualize the reader, and incidentally to form a general impression of the effect of the layout, display, length of sentence, etc., of the letter itself. By "listening back" he can check what he has said in exactly the way he said it, not as the stenographer helped him to interpret it. He can get the relations of phrases and sentences at his leisure. In many ways he can have a better conception of how his letter is likely to affect the addressee. Brusqueness of tone, and long, unwieldy sentences become apparent and can be more easily corrected. Another advantage is that the dictator can put down his dictation at any point when the need arises, without interfering with the work of another.

Effective dictation is in reality a method of letter-writing. While the dictator may possibly arrive at a result-getting letter without a preconceived plan, the most careful correspondents usually decide before they dictate just what their line of approach will be. In fact, the value of the raw material for letters like that of the raw materials for engineering projects is uncertain until a definite use is perceived, and a distinct plan of development is determined. The preliminary study which will suggest the most effective method of presentation as well as the points to be developed should never be overlooked.

This preliminary analysis of the dictator, as well as of any other letter-writer, has for its purpose:

1. Determining the main idea of the communication; that is, the part the letter is expected to play in handling the underlying situation and in effecting the desired action.
2. Determining the details that will be necessary to route the reader's thought and conviction so that the dictator can get the result he wants. These details include not only the definitely relevant material of the main idea, but also, within this limit, the relevant material that will make a special appeal to the particular reader.
3. Determining what the reader's relation is to the main idea; that is, what are the reader's apparent interests and what his reaction seems likely to be. Unless rightly treated, the main idea may make him antagonistic or leave him indifferent.

These are the determinations which any writer of the business communication makes before he sets out to convince and stimulate others. When dictation has become, through practice, a swift, keen, almost subconscious process, he is ready to make his sketch of the product or of the structure. This is the outline of the point or points which he has retained as the ones to present in his business communication. It consists of those points upon which he wishes to put the emphasis as he sets about to convince and stimulate others. This outline may be brief or extended, according to the training, purpose, and desires of the dictator. At first it may be necessary to put the main points down on paper. Such a method, of course, takes a little more time than the dictator often feels that he ought to spend upon individual letters. As soon as he has trained himself in organizing his material to the best advantage in a mental outline, he can discontinue jotting down his points on paper, if it becomes burdensome or slows down his speed too much. Where a large amount of correspondence is handled, however, it will always be found advantageous to note inconspicuously in the margin, or at the top of the letter, the topics which require answering. In fact, this is the practice of some of the most efficient letter-writers.

The inexperienced dictator need not feel, therefore, that proceeding slowly at the beginning will reflect unfavorably upon him. He should not be afraid to make use of a brief but comprehensive written outline of the points which he intends to include in the written communication. It is admittedly slow business, but it gives him training in accurate, systematic organization of material, and, finally, a system by means of which he can greatly increase his daily output. Ungoverned or misdirected speed is as destructive to skilful dictation and success in letter-writing as it is to the successful operation of any piece of engineering equipment. The aim by any method ought to be to meet the issues squarely. Shallow thinking and unsuccessful handling of the business communication result so frequently from hasty and incomplete analysis, and from indefinite outlining, that these points cannot be emphasized too strongly.

The dictator will profit, therefore, by making two processes of his handling of the idea for his letter:

1. He will decide upon his line of action.

2. With this definitely determined, he will then give all his attention to the most effective way of conveying his sifted ideas.

In this way he is better able to conform to the conditions imposed by the situation, and to dictate a letter that will tend to solve the problem successfully.

It is not necessary nor often desirable to let the outline show in the finished letter. The outline is to help the dictator to organize his message so as to secure concentration, and an easy presentation of ideas—*effective communication.* In no case is the outline to hamper a finished message or make it lose its personality. The outline is to guide, not to repress. *Planning, however, is always essential.*

There is no set rule for the dictator to follow in order to get the proper tone. The best possible suggestion is the one which has already been given in connection with the business letter: try to write—in this instance, dictate—as if the reader were across the desk. The best letter results from using the conversational style with the modifications that are demanded by the written presentation. In dictation, the conversational tone is perhaps more easy to maintain than in writing. Yet while it will tend to keep the tone of the letter from being too formal and too remote, it must maintain dignity. It must not take the legitimate short-cuts of direct man-to-man talk. The written communication, the written conversation, must be specific in its records and its references; that is, it must give the date of the addressee's letter, and a brief, concise, accurate, comprehensive statement of the point under discussion. In a personal conference, these records may be checked in various ways, but there is no other way in the written conversation. The dictated conversation must conform to all the rules for the written presentation of ideas; the style or method of presentation differs from that of the strictly oral style in this very point.

In testing out the letter, after it has been written, the following questions will challenge the main determinations:

1. Does the letter focus the reader's attention upon the idea?
2. Have the reader's needs been met, either directly or indirectly?
3. Is every single detail relevant?
4. Have the reader's individual interests been recognized?
5. Can any detail be omitted without affecting the tone and the emphasis?
6. Is there "remorseless and scientific efficiency in the use of words?"

If the dictator wishes to conserve his time and money, he must make it easy for the stenographer or the dictating-machine transcriber to take his idea. The dictator should be sure to enunciate clearly. He cannot expect the other person to divine his thought. While he can assume that the well-trained stenographer generally can handle the usual matters of spelling, punctuation, and capitalization, if he is using the dictating machine as an intermediary he cannot leave these matters of technique to the discretion of the transcriber. Indistinct enunciation, the similarity of sounds in the English language, the mechanics of registering the human voice on the cylinder, all contribute to the necessity for scrupulous attention on the part of the dictator to the small details which are necessary to putting thoughts on paper, if satisfactory results are to be insisted upon and secured. For instance, unless the dictator carefully spells and clearly enunciates, he will have from "who will inspire the prophets?" "Who will inspire the profits?" From "you stayed two nights and had one breakfast," the curious statement that "you had two pipes and one of them burst." The dictator cannot go on the assumption that the average person who types the letter knows the original thought or the incidents that prompt the letter. Though the transcriber is of secondary importance, she must be considered if the most effective work is to be done by her. If the dictator will take it upon himself to consider the transcriber and her limitations, the use of the dictating machine is very economical and satisfactory.

Dictating-machine companies have special directions that apply to the use of their particular machines; hence it is unnecessary here to go into detail and give specific directions for the use of any one machine. But with all, distinct enunciation and the specific directions to the transcriber, concerning such matters as punctuation, spelling, and capitalization, are necessary.

In dictation, therefore, the principal demands are the clear presentation of ideas and the direct, conversational style of statement. Dictation becomes effective when the dictator has definitely in mind a distinct plan from which his business communication proceeds. The value of the preliminary outline cannot be overestimated. This outline is the result of a careful analysis of the problem, the policy of the business, and the determination of the factor of safety which every person who is in a position of responsibility must always observe. The meeting of the problem directly and sincerely is always to be the first step in the analysis. Facility in dictation comes only through practice. Something to say, enthusiasm, and forgetfulness of self will go a long way toward overcoming a lack of power in dictation. Free dictation, without self-consciousness, makes for a very easy, smooth-running, and conversational style in letter-writing.

Practice in dictation by the engineering student has several values. Dictation gives him:

1. Practice in creating and handling the ordinary units of communication other than the monosyllabic answer to a direct question.
2. Practice in thinking in larger units of discourse than the word and the very short sentence.
3. Practice in getting the impersonal and detached angle upon his presentation of his own ideas, by means of which he is given an opportunity for self-criticism, for keeping out undesirable personalities, and for maintaining a clear perspective.
4. Practice in organizing his thoughts into a unified group to produce a definite effect upon a particular person.

COLLATERAL READING

Hall: "The Handbook of Business Correspondence," sect. XX, pp. 654–668. McGraw-Hill Book Company, 1920

K. O. Thompson: "Technical Exposition," chap. IX, pp. 135–136. Harper and Brothers, 1922.

"Language for Men of Affairs," vol. I, chap XII, pp. 236–259; chap, XIV, pp. 285–302; vol. II, chap. XXXIV, pp. 525–526, 530. The Ronald Press Company, 1920.

CHAPTER XVI

FORMS ESSENTIAL TO GENERAL PROFESSIONAL WRITING

To demonstrate to others his grasp of ideas, and to extend his own information, the engineer needs to be familiar with certain general forms of writing. These forms are:

1. The explanation
2. The abstract
3. The summary
4. The book review
5. The editorial
6. The article for the technical press.

All of these forms already have had two uses for the engineering student:

1. He has adapted them to his needs in carrying on his routine college work.
2. He has made them a means of increasing the range of his technical and general information.

He has used the explanation, the abstract, the summary, and the book review in his reports upon experiments and research topics. He has read editorials and long technical articles in the professional periodicals for the information which they contain. He has, of course, read abstracts, explanations, summaries, and book reviews, too, but he has usually written more of these than he has read. With the exception of the article for the technical press, all of these forms are usually short. They are the presentation of the matter under discussion in brief, compact form. Knowledge of these forms and practice in them, in college and after, will increase the engineer's information, and widen his professional outlook. Each has, therefore, in the present text, been made the subject of a chapter for separate study.

COLLATERAL READING

Watt: "The Composition of Technical Papers," pp. 281–290. McGraw-Hill Book Company, 1917.

"Language for Men of Affairs," vol. II, chap. VII, VIII, pp. 117–150; chap. XXXII, pp. 473–493; chap. XXXV, pp. 566-582. The Ronald Press Company, 1920.

Getting the Full Value of Technical Periodicals. *Engineering News-Record*, vol. 87, no. 11, p. 456, Sept. 15, 1921.

CHAPTER XVII

THE EXPLANATION

The explanation is seldom an isolated form of writing. Terms have to be defined, machines and processes have to be described. These explanations are not usually ends in themselves, but contributing members to more extended writing. Explanation merits special consideration on account of its important bearing upon specifications, contracts, and reports.

Explanation means making a subject clear. In this text, the limits of explanation for the engineer have been rather arbitrarily fixed to include:

1. Definition of specific terms, such as are always necessary in specifications and contracts.
2. Extended descriptions and detailed accounts of processes, conditions, methods, apparatus, materials, and operations.

Explanation is necessary for carrying on the simplest as well as the most complex parts of engineering practice. It tends to reduce the matter under consideration to its component parts, and to resolve them into the separate and fundamental units which make up the whole. It limits so that there can be small chance of error in meaning or identity.

Explanation should tend to be a photographic representation in words of the facts involved in the various phases of engineering practice. An explanation of a transit, for instance, may be only a definition of its purpose and an enumeration of its various parts; or it may include, in addition to these, an account of how the transit operates.

The use of a sketch or diagram—any vivid graphic presentation which is appropriate—furnishes a valuable means of increasing the clearness and of widening the range of the explanation. The engineer, however, should be warned against putting too much reliance, or entire reliance—which he seems often prone to do—upon the power of the sketch or diagram alone, to make his meaning clear, especially to the non-technical man. There is a greater margin of safety if the sketch or diagram is reinforced by an explanation in words.

One reason why the engineer is often inarticulate when he tries to explain anything is that he expects the sketch or diagram, unaided by words, to make his meaning clear. Yet even he does not depend entirely upon the sketch or diagram. A moment's consideration will indicate to him that the instructor in the technical subjects uses both methods in combination. After he has put the sketch or diagram on the blackboard, he usually reinforces it by an explanation in words. The sketch and diagram ought to be regarded as means of presenting examples to make the underlying subject clear. They are like any other illustrative material. They should not be expected to have unlimited force and significance when used alone. They reinforce, but their value is variable. The contribution of the sketch to the clear presentation of a technical idea can be brought out by considering the explanation of a topic which uses both the diagram and the written explanation. Take, for instance, the explanation of the couple in mechanics. If the student will ignore the written matter, and attempt to depend entirely upon the graphic explanation, he will discover that it is only when he is familiar enough with this topic to supply all the necessary verbal explanations for himself that the sketch can carry the whole burden. The sketch and the diagram belong, therefore, largely to the code for the communication of technical ideas to technical readers.

The explanation is usually short. The length is governed by the subject matter and the reader's knowledge, interest, and experience. According to the subject, it may be a simple, logical definition, consisting of a single sentence; or it may be the definition plus extended discussion of the essential parts of the definition. In the simple definition, the aim is a water-tight statement that will make for uniform and consistent practice. The aim is extremely difficult to achieve because people disagree in their interpretation of terms, and because they do not realize the value of definition to engineering practice. The following editorial suggests the need for exact definitions in engineering practice, and the difficulties involved in making them:

The Making of Definitions

In all probability the greater part of the engineering profession and its allied businesses consider the making of definitions trifling sort of work for men who are designing and building the world's structures and machines. There are dictionaries and encyclopedias where things are defined, and when these authorities fail, as they so often do in engineering matters, there is the common acceptance of the term to fall back on. Why waste valuable time trying to torture a lot of words into defining what another word means? Leave that to the philologist in his study.

Fortunately, there are a certain number of engineers who appreciate the necessity for precise and authoritative definitions, who have had enough experience in contract interpretation and with judicial inquisitiveness to realize that so far as possible every word the engineer uses in his work should have an unmistakable meaning and that groups of qualified engineers should put on record such accepted meanings, or, lacking a general acceptance, should set forth a majority understanding of the word in the hope that this will gradually become unanimous. These men are in the various technical societies, which pretty generally have appointed nomenclature committees for this purpose. Such committees are doing a useful and difficult work, but it is doubtful if either its utility or its difficulty are properly appreciated.

As an instance there is recalled the recent deliberations of a committee on the definition of so simple a material as sand. After much discussion there was evolved the definition that sand "is the loose granular product resulting from the natural disintegration or mechanical reduction of rock," which seemed to take care of the appearance, composition, and source and to cover the various interpretations of sand in the different arts. Outside experts called in immediately began to raise questions. What is a grain? What is rock? Is crushed slag sand? Under this definition, purposely written so as to include the mechanically reduced product known as sand in foundry practice, would not a concrete engineer be required to specify "natural" sand if he had objections to the use of crusher-reduced rock as sand? Thus it appeared that sand is not easy to define, but that at the same time its exact meaning might well become a matter of the greatest importance.

In some fields the necessity for definition becomes more a question of a nice precision than of technical or possibly financial importance. For example, there is unnecessary confusion of terms in river and shore protection work. Jetty, we think, is properly applied only to a roughly paralleling current-control structure at the mouth of a river. Yet it is variously applied to walls built out from the shore at or near a right angle, a structure which properly should be called a groin when built into a currentless lake or ocean and a spur dike or diversion dam or wing wall in a river; it is even sometimes applied to a mole or breakwater, which serve quite different purposes. There is a whole galaxy of words in this field to which meanings should be pinned down. Just what is a dike and how does it differ from a levee? What would you call an earth-fill built across a reservoir to permit the emptying of a part of the basin at a time?

Questions such as these are somewhat more than academic. To settle them requires a wide acquaintance with the field and a knowledge of the mechanics of language. It will not do, for instance, to define a certain kind of cement as "a cementitious substance which, etc., etc.," as did a committee of a leading technical society some years ago. And, as any one who has ever served on a nomenclature committee knows, difference of opinion as to well-known words is astounding. There should be a better appreciation of the necessity for consolidating such opinion and a greater effort made to perpetuate such definitions as are accepted by those who are engaged in formulating them.[1]

According to the reader's knowledge, interest, and experience, the explanation may be detailed or general.

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[1] Editorial, *Engineering News-Record*, vol. 89, no. 3, p. 91, July 20, 1922,

In the discussion of the letter of instruction, the statement was made that the reader's relation to the instructions limited them. Instructions are practically always explanations; but not all explanations are instructions. The rule for length of instructions applies to length of explanations. If the reader is uninformed, and unfamiliar with the technical language, then there is need for extended explanation. If the reader is a specialist and knows the code, then the explanation may be brief and compact. Detailed and extended explanation may, however, be required for the specialist as well as the non-technical man. But the details are not the same, nor do they move in the same direction. For the non-technical man, they are used to make a few of the outstanding parts clear. For the specialist, they are employed to develop the minutiae of the topic requiring explanation.

For both types of readers, irrespective of whether the language is technical or non-technical, there should never be any possibility of double meaning in definition, or vagueness in the choice of words in the extended explanation. The fundamentals of explanation are: (1) The preliminary analysis to determine definitely the idea that must be limited and made clear; (2) the classification and the organization of material to bring out clearly and completely the specific thought, and to decide accurately and concisely the final form in which the explanation is made. In logical definition, the aim is to identify an individual idea as belonging to a certain genus or class, and to discover the differentiae or peculiar points which distinguish it from every other member of the class. Under the head of logical definition, come the attempts to define such words as *engineering, engineering ethics, a contractor.*

In addition to this method of explanation, there are four ways of developing ideas which will make them clear:

1. By proceeding from the simple to the complex. An example of this method is the description of the Olsen Testing Machine as having two functions—first, to break samples, and, second, to measure the breaking force. Once these simple principles are enumerated, the complicated details of the machine may be intelligibly described.
2. By proceeding from the known to the unknown. For instance, to one who is familiar with the automobile engine, the explanation of the Diesel engine which begins with a reference to the automobile engine, makes for clearness.
3. By comparing and contrasting. In this connection, one may explain the transit as a specially mounted telescope.
4. By enumerating details in chronological order. This last method lists details with almost photographic accuracy. The engineer uses it extensively in making a subject clear.

The choice of method depends upon the engineer's and the reader's knowledge and experience.

Practice in explanation comes to the engineering student daily. In his intensive study of English, his aim should be to find if his practice measures up to the standard for effective explanation. If he decides that he is not already skilled in explanation, he should take immediate steps to become so. Many weaknesses in examinations will be eliminated through power to explain clearly the observations which have been made in the laboratory and in the field on the operation and procedure of engineering practice. More power for extended oral discussion will come if he can present in class a clear explanation by word of mouth.

Explanation is absolutely indispensable to the engineer. He needs it in writing his examinations in college, in his reports, his specifications, and his contracts after college. It must be accurate. It must be clear. It must identify and limit. It demands no interpretation of facts but strict adherence to facts.

COLLATERAL READING

KIRBY: "Specification Writing," chap. V, pp. 43–49; chap. XII, pp. 122–125. John Wiley and Sons, 1921.

D. W. MEAD: "Contracts, Specifications and Engineering Relations," chap. V, p. 95, par. 50, 51, and 53; chap. XIV, p. 238, par. 148. McGraw-Hill Book Company, 2nd ed., 1920.

Arbitrating Contract Clauses. *Engineering News-Record*, vol. 89, no. 7, p. 258, Aug. 17, 1922.

Design or Invention Again. *Engineering News-Record*, vol. 89, no. 4, p. 129, July 27, 1922.

Electrolytic Corrosion of Steel Water Main at Akron, Ohio. *Engineering News-Record*, vol. 89, no. 8, p. 308, Aug. 24, 1922.

CHAPTER XVIII

THE ABSTRACT

Three forms of writing—the abstract, the summary, and the book review—condense extended articles and books to forms easily accessible for the reader. As the engineering student uses them, they furnish a means of demonstrating to his instructor that he has covered certain reading assignments, has grasped comprehensively the essentials of a discussion and can give back the information concisely, clearly, and accurately. For the practicing engineer, as well as for the student, they are a means of saving time in the securing of information. Only a cursory survey of engineering periodicals is necessary to indicate what a wide and constant use is made of them to save the time of the technical reader and to give him information in condensed form.

All three of these forms of writing require skill in getting relative values and in comprehending the originals in their entirety. The aim of all is alike—that is, to take the place of actual and extended reading by the engineer, yet to give him the outstanding facts of an entire discussion. These forms are to save time and effort for the reader. The methods they employ are not alike. Their differentiation depends upon the relation each has to the original article or book.

The abstract may be compared to the reduction of a drawing. It is a short and accurate reproduction of an extended discussion. It takes into account all the large aspects of the original, selects the most important and significant thoughts, and sets them down exactly in the words and in the order of the original. To be reliable, it must be the selection of those outstanding sentences that will represent without bias the entire original discussion. Illustrations are usually omitted, but necessary figures and facts are retained. The abstract is the original in its entirety, but reduced to its lowest terms in a way that does not limit the scope of the material nor detract from its original presentation. In the abstract, no attempt is made to draw conclusions from the facts for the reader. It is assumed that his purpose in reading the abstract is for the accessible information that it contains. He can draw his own conclusions. The abstract should give the tone and the spirit of the original. The personality of the abstractor should never be evident. He, like the guide in an industrial plant, points out the features worthy of note, but leaves the members of the inspection party free to make their own interpretations. The student making an abstract selects the main points of the original and assembles them in unified form. From this condensed form, the reader may be reasonably sure that he is getting an accurate condensation of the original article in its entirety.

Abstracting books and articles for later reference is very profitable. The abstractor should be extremely accurate in his identification of the original book or article. If a book is the original, he should put down the exact title, the correct initials and the correct spelling of the author's name, the date of publication, and the edition. If a magazine, in addition to the exact title and correct writing of the author's name, he should give the occasion for the original discussion, the name of the publication, the volume, number, page, and date. If a professional paper or an address, he should give the occasion and the title and the exact name of the author. The abstract, in fact, should observe the same standards of reference that any good, reliable bibliography contains.

Since the purpose of the abstract is to convey accurately the thought of the original, it is only fair to quote the sentences in their entirety. Indeed, it is very unethical to quote only those parts of sentences which, unless they were presented in their proper relations, would be sensational, or which would tend to prove a particular thesis of the abstractor. He must have the open-minded attitude of the scientist. He must record what he finds, not what he wants nor what he thinks he ought to find. Even though the thought is diametrically opposed to his, he must report what he finds in the original. It is in no way fair to remain only within the technicalities of procedure in abstracting, and by half-quoting, not actual misquoting, so to garble the statements of the original that the result has all the bad qualities of actual misquoting.

The discussion thus far has had to do with the actual methods for abstracting extended material by the engineer himself. The abstracts made for him by others, as they appear from issue to issue in the technical periodicals, have high informational value. He can get, in brief compass, comprehensive information upon a wide range of professional and general subjects. Through the abstract, he has an easy and reliable means of keeping abreast of the times in his particular branch of engineering, or gaining breadth of outlook through knowledge of the larger aspects of the profession and allied interests, and of increasing his understanding of the general trend of thought and action in all walks of life. He is saved time, but is not restricted in his reading. If the subject abstracted is of special interest, he can readily follow it up and read the whole of the original discussion.

Instances of the constant and varied use of the "abstract for the benefit of the engineers" are numerous in the engineering periodicals. Some of these abstract only technical material for the specialist. Since this is almost wholly in code, it reduces the original to little more than a collection of formulae. *Chemical Abstracts* and *Science Abstracts* furnish examples of this type. Others abstract the articles, the papers, and the addresses that are of general professional interest. These abstracts include the condensation of foreign articles, papers read before professional societies, addresses given before various groups of people by engineers and by others. Still others abstract correspondence.

The abstracts, which follow, show two methods that are widely used in technical magazines: In the first, the abstract is preceded by an introduction written by the editor, which indicates at the outset the conclusion of the speaker.

Research as Important as Instruction in University Work[1]

At the annual meeting of the Western Society of Engineers, C. R. Richards, for several years dean and director of the College of Engineering, University of Illinois, and now president of Lehigh University, laid down the principle that scientific research should be given a standing equal to that of instruction in the aims of the modern university. What follows is an abstract of President Richards' expression on the subject.

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[1] *Engineering News-Record*, vol. 89, no. 8, p. 320, Aug. 24, 1922.

Research and Instruction.—It should be the purpose of real universities to place scientific research and the advancement of knowledge in a position of equal importance with the work of instruction. The tremendous development of technical education during the past fifty years, with the constantly increasing number of technically educated men in industrial life, has increased the need for more exact information concerning the scientific basis of industrial activities, and demands that those responsible for the advancement of these activities utilize more effectively the results of technological research. Whatever may be the future of technological research in the universities as compared with that in private laboratories, the fact remains that educational institutions have blazed the way and have made the importance of such research fully apparent.

Until recently, comparatively few of the engineering industries have appreciated the value of scientific research. Now, most of them are alive to its importance and many of them have undertaken its promotion by one means or another. It is difficult to determine when a corporation or an association of concerns having a community of interests, can justify the organization of an independent research laboratory. The great expense of operation, the difficulty of securing men competent to do research work, and in many cases the failure to recognize the nature of the problems to be solved, are likely to bring many of these commercial laboratories, as well as research in general, into disrepute. A commercial organization which is forced to show suitable profits to its stockholders may have difficulty in properly evaluating the work of its own laboratories.

It is probable that the solution of the problems of most industries can best and most economically be undertaken through association with the universities and technical schools. Emphasis should be given to the fact that ordinarily such cooperative arrangements are entered into with no expectation of profit and that a well-equipped institution has scientific facilities both in apparatus and men which cannot readily be duplicated in any private laboratory. Thus, in the field of engineering research as conducted in a modern university the scientific workers have advantages through association with the professors in physics, chemistry, bacteriology and other branches of pure science which may have a direct bearing upon engineering investigations in progress. Many leaders of industry have looked upon men engaged in academic pursuits with some contempt, but this attitude is rapidly changing. In an ever-increasing degree the industries of the country are looking to the technical schools for assistance, and are cooperating with them to their own advantage as well as to the advantage and advancement of education and knowledge.

In the second, there is no introductory matter that indicates to the reader before he reads the abstract, the conclusion of the writer of the paper which has been abstracted.

Treatment of Car Sills and Decks

By Forrest S. Shinn

Tie Treating Department, Chicago, Burlington & Quincy Ry. Co.
Abstract of paper before American Wood Preservers' Association.

Since 1911 the Burlington railroad has treated 1,300,000 ft. of car sills and 1,800,000 ft. of car decking. We are not in a position as yet to know just what results will be obtained from this treatment, as none of the lumber has been taken out for any cause except on account of being broken; however, in view of the fact that we are taking out yearly a large amount of untreated flooring on account of rot, we feel that the money spent for treatment has brought good returns. We have not made any tests on this material, comparing the strength of the treated lumber with the untreated, but from close observation have come to the conclusion that treatment very materially increases the hardness and makes it much more resistant to wear. Many untreated planks in cars built in 1911 and 1912 have been worn so thin that they have had to be replaced.

No floors or sills for open-top coal cars or flat cars have been treated, but, while this flooring is not subject to conditions that will produce rot as quickly as in stock cars, I believe that from an economic viewpoint we would be warranted in treating it. I have seen hundreds of these cars where the flooring showed signs of rot to a very considerable extent, and it is a very common sight to see where the sapwood along the edges of the planks has sluffed off, leaving the top of the plank in the shape of a half-moon. This very materially weakens the floor, finally causing it to break.[1]

The abstract, therefore, is a source of great value to the busy engineer. Its purpose is to give information. Its worth depends upon the abstractor's power to grasp a discussion in its entirety, to pick out the underlying statements around which the whole discussion centers, to recognize the differentiations, and to boil down the extended discussion to its lowest terms without in any way affecting the spirit of the original.

Sometimes *extracts* of professional papers and addresses appear in the technical periodicals. These should not be confused with abstracts, though they are also verbatim renderings of the original. These verbatim renderings, however, do not condense the entire discussion. In fact, they do not condense at all. They are quotations of interesting and outstanding paragraphs which have the significance, when isolated, that they had in the original discussion. Sometimes the relation to what precedes or follows is indicated, but more often they are quoted for their own inherent worth. They, too, are informational, but they deal with small units of a discussion, which have interest out of the context.

The following is a typical extract:

Extract from address before the
National Conference of Social Work,
Providence, R. I., June 27, 1922.

One of the problems in which there is much discussion is that of the hours of labor. In any discussion of this subject, we must embrace three points of view—the engineer's, the economist's, and the social student's. Both the engineer and the economist must insist on the maximum productivity. For the maximum production is the only foundation on which we can obtain more general higher standards of living. The argument is simple enough, for the more cheaply commodities can be produced, the larger are the number of people who can participate in them.

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[1] *Engineering News-Record*, vol. 88, no. 11, p. 442, March 16, 1922.

The Problems of Quantity Production.—The engineer, however, does not advocate unlimited hours; he does not obtain the maximum production when fatigue and deterioration in product begin to supervene. His view of human fatigue and of human deterioration leads directly to the restriction of hours to that number that will permit of best performance and efficiency in the tasks in the long view. The engineer takes more than the immediate view of a day's work, for there are some tasks of repetitive character which tend to intellectual and moral deterioration in the long run. It is one of the first problems in front of the engineer to find such a diversion and stimulation to intellectual interests either directly in the task itself or indirectly in some association with it that will prevent not only fatigue but deterioration itself. While this problem is of high importance, I am not one of those who think that the fabric of the nation is about to collapse because we have developed mechanical tools for mass production, for the very minor malign results that have accompanied these inventions can be overcome. The length of hours of labor in the vision of the engineer will vary with every task. There are many tasks in which four hours is too long for continuous action. There are other tasks such as that of the caretaker of an empty house where twenty-four hours, six days in a week, would not be absurd from a physical point of view.

The social student must approach the question from another and equally vital point of view, and that is family life, citizenship, and opportunity for recreation and intellectual improvement. These limitations are mandatory, and whatever the right hours may be as between these vital social limitations and the limitations imposed by the view of productivity, it is a certainty that the twelve-hour day or seven-day week cannot be entertained by any well-thinking social student. We have set up as a matter of public sentiment eight hours as an approximate standard, yet no empirical number can be right. The engineer is the proponent of scientific study into the hours in which maximum productivity can be obtained and maintained. We need these studies by the engineer and social student in every industry, for hours too short are an injury to the rest of us in that they impose lower standards of living upon us; and hours too long are injurious to the individual, thereby the race.[1]

COLLATERAL READING

Gay: "Writing Through Reading," chap. IV, pp. 41–53. The Atlantic Monthly Press, 1920.

Chemical Abstracts. Any issue.

Arthur W. Greene, Jr.: Present Trends in Engineering Education. *Engineering and Contracting*, vol. 58, no. 1, pp. 7–8, Oct. 25, 1922.

Mechanical Equipment as a Factor in Building Design. *Engineering News-Record*, vol. 89, no. 1, p. 23, July 6, 1922.

Progress in Water-wheel Design. *Engineering News-Record*, vol. 88, no. 22, pp. 919–921, June 1, 1922.

Report on Elimination of Waste in Industry. *Mechanical Engineering*, vol. 43, no. 9, pp. 579–583, September, 1921.

Short Abstracts of the Month. Column, *Mechanical Engineering.*

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[1] Herbert Hoover: *Engineering News-Record*, vol. 89, no. 5, p. 188, Aug. 3, 1922.

CHAPTER XIX

THE SUMMARY

The summary has a great many points in common with the abstract. In fact, the terms *abstract* and *summary* are sometimes used interchangeably. They differ in this: the abstract consists of key sentences from the original; the summary is a statement of the matter in different words—a boiling down. It is the result of condensing many points, of eliminating many details, and of focusing the attention upon the underlying generalization. The summary must be brief, concise, accurate, and comprehensive. It is the result of condensation. To write a successful summary demands more than the power to select significant thoughts. Being stated "in his own words," it has the individuality of the summarist in the outlook and in phrasing; yet it must be as free from bias as the abstract. It is not expected to convince or to make the final conclusion for the reader any more than is the abstract. The purpose is to give information and leave the reader free to interpret for himself.

The summary, as an isolated form of writing, rests upon the same procedure as the summarizing section of a long paper. The summarizing paragraph gathers together in concise, compact form the most important parts of the discussion so that the reader will have at the close a definite impression of the whole article. He may value this solely for the information it contains, or for the terse statements which make easily accessible the ideas in which he is most interested. This accessibility is evident in the summary, usually called the conclusion, of the engineering report.

When the engineer uses the summary, he has one of two purposes in mind: (1) He intends to condense in his own words, according to his own methods and his own plan, the extended discussion of another. Then its function is identical with that of the abstract and its range is the same. It differs from the abstract only in the fact that it does not use the phrasing of the original. (2) He intends to organize and assemble in brief, compact form his own observations and his own ideas upon his professional undertakings. His first purpose makes him dependent entirely upon the lead of another; his second throws the whole burden upon himself. As a result, the second requires more of him in the way of skill in identifying and relating details to a larger whole. He has to think out the whole idea with all its details, whether or not he puts them down on paper; that is, he must get his perspective on his own ideas before he makes his summary.

In a sense, the summary that results from this second purpose is really the summary section of an extended discussion. It is regarded as an isolated form of writing when only the summary is written out. This second purpose of the summary aids the engineering student in making his generalizations upon his work. A large part of his professional work has to do with the making of summaries of detailed work for others to use as a basis for their action. The writer finds the summarizing paragraph a good means of checking the unity and scope of his whole discussion. This summarizing section of a long paper is generally given prominence in every professional paper. The summary, in fact, is often the only part of the paper that is reported. When this is the case, it is practically an extract.

The summary which appears below is typical:

To summarize the principles that have been here laid down we submit the following:

1. Licensing must be justified wholly on the ground of the public welfare and not at all on that of professional advantage.
2. To be of value to the public a license must define accurately the kind of engineering work in which the licensee is qualified.
3. The requirement of license need apply only to those having ultimate technical responsibility.
4. Licensing is not required to protect those who need the services of an engineer against imposition by charlatans.
5. Public protection by licensing should be considered only for those fields in which experience has demonstrated the possibilities of a public peril that cannot be more effectively provided against by other methods.
6. Public protection by license should cover every phase of the fields so protected in order to insure unbroken technical responsibility from inception of plan to completion.

We believe that if the licensing of engineers is to be justified it must be established on the basis of these principles. Some of them have been observed in some of the laws that have already been enacted. We are persuaded that the closer the licensing movement clings to the requirements of public policy and the more nearly it conforms to all these principles, the more likely it is to accomplish the public service that is the avowed purpose of its advocates.[1]

The summary, therefore, may be of great service to the engineer. It may be a means of giving information in condensed form, the same as the abstract. When information is its purpose, the thought of another must be retold with accuracy, clearness, and conciseness. To gain this end, the summarist must project himself into the spirit of the original, and catch the vision and aim of the writer. Though the words of the summary are not those of the original, the thoughts must be. It must represent the original faithfully. The summary also has an additional value to the engineer in that it may aid him in discovering his way in the midst of many and often confusing details, and in subordinating these details to the large plan. When this second purpose predominates, there is need for the ability to sink details into the larger whole and to weigh values. The engineering student will find on all sides much use for the summary. He can get much practice in summarizing his technical observations, his reading, his class work, his ideas upon engineering, his thoughts upon life. The summary, in fact, helps him to formulate his working laws.

COLLATERAL READING

FOERSTER: "Summaries and Outlines." Henry Holt and Company, 1915.
GAY: "Writing Through Reading," chap. IV, pp. 46–48. The Atlantic Monthly Press, 1920.
SYPHERD: "Handbook of English for Engineers," pp. 199–206. Scott, Foresman and Company, 1916.

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[1] *Engineering News-Record*, vol. 89, no. 1, p. 9, July 6, 1922.

CHAPTER XX

THE BOOK REVIEW

The book review, like some of the business letters, may be used by the engineer for immediate profit. It is usual for the engineering student to have to read extensively in books and magazines in connection with some of his professional courses. To demonstrate his knowledge, he hands in, from time to time, reviews or summaries of what he has read, to which he sometimes appends some personal comment. Frequently, the technical instructor has not given specific directions as to how to go about the work. As a result, the student has only a vague idea of what he ought to do and how he ought to proceed to demonstrate, by the written work which he turns in, that he has met the requirements of the assignment. Often he has the impression that all that is expected of him is to indicate by his review that he has had the book in his hands and has scanned the pages. If this superficial handling results in several pages loosely abstracting the original, he feels that he has met the demands of his task. Yet, if this superficial result is all that he gets, the time taken to get even this might have been better spent. The book review should be more than a demonstration that one has scanned the book. It should give information on the contents.

The book review employs some of the methods of both the abstract and the summary. Indeed, it usually consists of the summary or abstract, in which are briefly given the contents of the book or article, plus the personal and critical comments of the writer. Frequently, the engineering student does not make his book reviews full enough, because he knows that the instructor has read the book he is reviewing. His aim, however, under all circumstances, should be to give an accurate, straightforward résumé of the book for the reader who is dependent upon the reviewer's account for all of his knowledge of the book under discussion.

The method of procedure for a book review may be considered under (*a*) *preliminary steps* and (*b*) *actual writing*. The preliminary steps are a careful reading of the book or article, with such notes as will be necessary later to refresh the memory of the reviewer; next, enough reflection, after the completion of the reading, to get clearly in mind the thesis or central idea; then, a rapid review to fix and relate the "epoch-making" or significant facts, or the essentials; finally, a brief outline, mental or written, as the individual case may require, to determine the most effective means of presentation. The standard for the book review, as it is actually written, must be a coherent, unified, finished piece of work, not a jumble of unrelated jottings.

The student should state at the outset, the title and author of the book or article. Frequently these are not a part of the book review proper, but appear in the heading. Then he should present only the main ideas; he should omit all the illustrations, examples and detailed explanations, except such as are typical. While generally, these are important to make clear to the reader of the entire book or article, the central thought of the original, they are not important to the reader of the summary. He has time only for the big things.

After the reviewer has summarized or abstracted sufficiently to suit his purpose, the final thing is for him to pass some personal judgment, within the limits of his ability, upon what he has read. This critical matter should be a vital part of the review and logically should come at the end, after the summary. In this critical part, the student should include statements of his own individual judgment as to:

1. The truth and accuracy of the subject matter.
2. The scope or comprehensiveness of the treatment.
3. The effectiveness of the method of presentation—clearness, detail, accessibility, style.
4. The weaknesses, if any.
5. The final value of the book or article.

In other words, the reviewer should give his recommendations concerning the book not as an advertiser but as a sane critic. He must be sure to leave, at the close, a definite, distinct impression of the writing in the mind of the reader. It is often well, especially in connection with the critical discussion of long articles, to quote so that a particular point may be emphasized or the source upon which the reviewer has based his impression may be indicated. This quoting, however, should be done with extreme care and caution, not only to represent fairly the original writer, but also to keep any one part from being disproportionately developed. It is usually better to include all the significant quotations or keywords in Part I. If this has been rightly handled, there is no need for much quoting in the critical part. The main aim of the book reviewer must be to leave in the mind of his reader a definite, distinct impression of the original.

Most of the technical periodicals from month to month publish reviews, both signed and unsigned, of new books and other publications that are of interest and value to the engineer. These reviews are written by men competent to pass judgment both on the subject matter and the style of the book. When these reviews are signed, they have added significance, because of the prestige of the reviewer. The reviews in the technical periodicals cover those books which the reviewer feels are worth the engineer's knowing about, even though he may not have a chance to read them for himself. Another advantage of a good review is that it may be used as a standard of comparison. After the engineer has read the original and has attempted a review for himself, he will profit by comparing his with that of an experienced reviewer. By this means, he can rate his own powers of judgment and penetration.

In the book reviews which follow—one unsigned, and one signed—the student will note the breadth that is possible in these brief discussions. This first illustrates the unsigned review.

THE DESIGN OF STEEL MILL BUILDINGS

By Milo S. Ketchum: McGraw-Hill Book Co., 1921. $6.

One of the marvels of the last thirty years has been the extraordinary use made of steel in the construction of buildings. The builders of the mediæval cathedrals, though they surpassed our modern structural engineers in architectural instinct and noble conceptions, would be amazed to see the steel girders that support our high buildings. Professor Charles P. Warren has remarked that if the Woolworth Building had been erected in the old way, with bearing walls, they would need to be more than ten feet thick instead of 3 feet 8 inches. Cooper Union, constructed about 1860, was the earliest structure in which iron beams were used throughout the floor construction. The Eiffel Tower, completed in 1889, gave a great impetus to the use of iron and steel in structural work; and, as the price of steel declined from 20 cents per pound to 1½ cents, its use in building grew apace.

Professor Milo S. Ketchum's "The Design of Steel Mill Buildings" treats technically of the use of structural steel in such buildings as factories, powerhouses, ware-houses, etc. The book has been completely rewritten since its first appearance, eighteen years ago; since that time many thousands of copies have been sold, and the author has transferred from dean of the college of engineering of the University of Colorado to director of civil engineering at the University of Pennsylvania. This book is a companion volume to the author's widely known "Structural Engineers' Handbook," but each is independent of the other. It has been universally praised in the technical magazines and has been held up as an example of the superiority of American engineering over British engineering—at least superior in the ability to write such a usable book on structural engineering, combining theory and practice in the right proportions. The first part of the book treats of stresses in framed structures; the discussion then passes to calculations of deflections and secondary stresses, ending with the design, construction, and specifications for steel-frame mill-buildings, smelters, etc. As Mr. R. Fleming remarked in the *Engineering News-Record:* "No engineer who has anything to do with steel buildings is fully equipped for his work without," The Design of Steel Mill Buildings.[1]

This second illustrates the signed review.

Pioneer Investigations of Acoustics

REVIEWED BY F. R. WATSON

Professor of Experimental Physics, University of Illinois

COLLECTED PAPERS ON ACOUSTICS—By Wallace C. Sabine, Late Hollis Professor of Mathematics and Natural Philosophy in Harvard University. Edited by Theodore Lyman, Cambridge, Mass : Harvard University Press. Cloth; 8 × 11 in.; pp. 279: illustrated. $4.

Professor Sabine's important investigations in architectural acoustics have been set forth in various periodicals since 1900. His unexpected death in 1919 made it desirable to publish the available results of his work in a single volume. The labor of collecting this information was undertaken by Professor Theodore Lyman, a colleague of Professor Sabine's, who also acted as editor for the publication.

The papers deal almost entirely with the acoustics of buildings. The larger part of the discussion concerns the action of sound in auditoriums, a question which first engaged Professor Sabine's attention. Two papers on: "The Insulation of Sound and Building Material" and "Musical Pitch" mark the beginnings of a fundamental investigation of a second important problem, which unfortunately was interrupted by

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[1] *The Literary Review*, vol. 2, no. 40, p. 727, June 10, 1922.

Professor Sabine's death. A paper entitled "Melody and the Origin of the Musical Scale" suggests the theory that the musical scale might have been developed when enclosed rooms were first used, because of the prolongation and overlapping of successive tones in singing. "Whispering Galleries" is the title of a paper dealing with the whispering phenomena exhibited in some rooms and natural caverns.

The extension papers on Reverberation give important conclusions concerning the acoustics of auditoriums that resulted from Professor Sabine's pioneer work in this little-understood subject. He developed the formula: $t = kV \div a$ where t is the time taken for a sound of standard intensity to die out in a room, k is a constant, V the volume of the room and a the sound-absorbing power of all the surfaces. To make the formula of practical use, he experimentally determined the coefficients of absorption for the surfaces usually found in auditoriums—plaster, wood, glass, etc.—as well as individual objects, such as chairs, people, pictures, etc. By means of this equation and the constants, any auditorium, whether already constructed or in the process of design, can be analyzed and recommendations given for securing satisfactory acoustics.

Professor Sabine's substantial findings have given confidence to other investigators to proceed in this difficult domain. In the United States, additional investigations have been made by Stewart, Watson, and P. E. Sabine. (See Bibliographies in Bulletins 73, 87, and 127 of the University of Illinois Engineering Experiment Station, Urbana, Ill.) Professor Franklin in America and Jäger in Vienna developed reverberation formulas from theoretical considerations that conformed with Sabine's results. Aigner in Vienna calculated sound-absorbing coefficients by instrumental measurements that were in agreement with the ear measurements taken by Sabine. A recent book by Eugen Michael, "Hörsamkeit Grosser Räume," draws heavily from Sabine's conclusions.

It may well be said that the investigations described in these Collected Papers clear the subject of acoustics of buildings from the fog of mystery that previously enveloped it and allow the essential phenomena to be seen in the light of scientific laws. Professor Sabine's pioneer results furnish the basis for any further advances in this field.[1]

Then there are the book notices which appear from time to time in the technical magazines. These, as the name implies, are notices in brief, impersonal form of new books, pamphlets, and bulletins which have been recently published. They give usually only such information as would be of value in ordering. They rarely contain critical statements upon the subject matter of the book or other publication. They are purely informational. In the examples of book notices which appear below the first suggest the topics which "Science of Purchasing" covers; the second, gives only matter that will make the ordering of "An Introduction to the Study of Labor Problems" easy.

Science of Purchasing. By Helen Hysell. D. Appleton and Company, N. Y., 1922. Cloth, 5 × 8 in.; pp. 261. $2.50.

Discusses the qualifications of a purchasing agent, the principles and policies to be adopted, the legal, economic, and ethical principles to be observed, the organization and conducting of purchasing departments.[2]

AN INTRODUCTION TO THE STUDY OF LABOR PROBLEMS—By Gordon S. Watkins, Ph.D., Associate Professor of Economics, University of Illinois. [Crowell's

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[1] *Engineering News-Record*, vol. 88, no. 20, p. 839, May 18, 1922.

[2] *Mechanical Engineering*, vol. 44, no. 12, p. 872, December, 1922.

Social Service Series.] New York: Thomas Y. Crowell Co., Cloth; 6 × 9 in.; pp. 664. $3 net; postage extra.[1]

Some technical periodicals, also, have a column, in each issue, devoted to brief digests of trade catalogues.[2] Here is an interesting opportunity for the young engineer who wants to get material published, and wishes, besides, to know some of the demands of publication. Incidentally this reviewing is an excellent means for getting knowledge of a particular business, and the material for the "you" attitude which the young engineer needs before he writes his letter of application. The examples which follow indicate how much detail may be included in the brief digests.

Concrete Block Machinery.—THE J. B. FOOTE FOUNDRY Co., Fredericktown, Ohio, sets forth details of its line of Panama concrete and block-manufacturing machinery in a 40-page illustrated catalogue. Both hand-power and machine-driven batch and continuous mixers are described, with capacities varying from 3 cu. ft. upward. Molds for ornamental block of a number of styles are pictured and the process of block manufacture with the company's machine is illustrated. The text contains practical suggestions on the use of concrete block for residential buildings, garages, and silos.[3]

Fumes in Mining.—THE HERCULES POWDER Co., Wilmington, Del., is distributing in the form of a 43-page multigraphed pamphlet a paper by J. Barab entitled, "Fumes Encountered in Mining Operations and Handling of Explosives." It is a compendium of valuable information from many sources, dealing with coal and metal mines and rock tunnels. The text discusses fully the products of explosion and the physiological effects of gases, and curative measures.[1]

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[1] *Engineering News-Record*, vol. 89, no. 12, p. 489, Sept. 21, 1922.

[2] Out-of-the-Ordinary Trade Publications. *Engineering News-Record;* New Catalogues, *Power*, furnish examples.

[3] *Engineering News-Record*, vol. 89, no. 9, p. 373, Aug 31, 1922.

Besides giving the engineer information upon technical books, the book review has a wider use. Through the reviews on books of general and literary interest that appear in some of the general magazines,[2] he can maintain his cultural interests.

All these condensed forms for giving information—the summary, the abstract, the book review, as means of acquiring information—have this common weakness: Accurate, reliable, fair, and sincere though they may be, they represent only one person's opinion. They can never altogether take the place or have the force for the reader that reading the original has. The engineer's reading of the originals is determined by time, interest, and the importance of the subject to him. Time in professional practice may force the engineer to depend upon these time-saving practices in writing. General rather than intense special interest may lead him to feel that, for him, generalizations are quite sufficient. The importance of the subject to his work or his experience may determine the extent, scope, and thoroughness of his information. Again, not all books are worth reading in their entirety. It is more wise to take the word of the competent reviewer than to waste time going through material with only transient value. With a large number of general books, it is often better to let them stand the test of a few years, and accept the critic's word. The reader must always, recognize, of course, that oftentimes individual reactions will vary. First-hand information might radically change one's judgment.

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[1] *Engineering News Record*, vol. 89, no. 9, p. 373, Aug. 31, 1922.

[2] A good one for this purpose is *The Literary Review*, a weekly periodical in which are reviewed books on all subjects—novels, short stories, poetry, science, and engineering.

COLLATERAL READING

"Language for Men of Affairs," vol. II, chap. IX, pp. 155–159. The Ronald Press Company, 1920.

Thomson: "The Outline of Science." Reviewed by Vernon Kellogg. *The Literary Review*, vol. 2, no. 17, p. 839, July 29, 1922.

"Waste in Industry," by the Committee of the Federated American Engineering Societies. Reviewed by W. L. Stoddard. *The Literary Review*, vol. 2, no. 1, p. 334, Jan. 7, 1922.

CHAPTER XXI

THE EDITORIAL

The technical editorial is one that the engineer needs largely as a means of broadening his professional outlook. As a constantly increasing source of professional information and power, it has few equals. It is original matter, usually brief but comprehensive in its reach. It is not a form, however, in which the engineer can have much immediate or extended practice. It usually requires more penetration, a keener sense of relationship, and a wider experience of life and men than the young engineer can be expected to have. The technique in the writing of the editorial, therefore, is not necessary now to the engineering student. Its discussion here is valuable for the knowledge of what it may contribute to the thought and life of his profession in all its complex relations. He is interested primarily as a reader of editorials.

Every technical magazine of any influence whatever has its editorials. These represent the conception that the editor or the editorial writer has of the thought, projects, actions, and movements which concern and influence the engineering profession. These editorials vary in length from a short paragraph of fifty words to five or six long ones totaling more than a thousand words. Although the statements are impersonal in presentation, they are stamped with the individual outlook and interpretation of the editor Even though his thoughts may be impersonally phrased, his knowledge, experience, and standards influence his ideas. The editorial writer has a tendency to codify isolated facts, to give them their proper relationship, and to point out the significance of facts in science, politics, education, that the average person often would overlook.

The constant reading and study of editorials in the technical magazines give the student a means of getting the trend of engineering in general, and of his branch in particular, from men who have faith, confidence, enthusiasm, and knowledge of the profession. In editorials, they discuss the narrowly technical topic, the broad professional topic, and the general one concerning which the engineer needs knowledge and understanding in order to be a cultured gentleman. Even the editorials of college periodicals show the possibilities. The following is typical:

THE ENGINEERING SOCIETIES

The importance of becoming affiliated with an engineering society while in school cannot be overestimated. It is perhaps a little difficult for one who has not attended regularly the meetings of his society to see in just what way he could benefit by such an attendance, but for one who has attended these meetings, listened to the lectures, mingled with his fellow classmates, and taken part in the social affairs of the society, no further proof of the advantages enjoyed need be presented.

To learn by experience is all right, but to profit by the experience of others is better. By attending the lectures given under the auspices of an Engineering Society, one hears of the experiences of prominent men of the profession and learns of the problems which he himself may have to face in the course of his professional career. In this way he is enabled to keep in closer touch with the world of engineering, and gains valuable bits of knowledge which can be obtained in no other way, and which alone would justify membership in a society.

But in addition to this, there are the benefits which come from mingling with one's classmates in meetings and at banquets. The engineer of the past has not established for himself a reputation for being an ultra-social individual, but even to the engineer, the advantage of a more active participation in the social life of the community is becoming more and more apparent every day, and for him to neglect this side of his development is to neglect a part of his education.

More especially in the past year engineers on the campus have shown a disposition to do things, and that inclination has borne fruit. The best way to keep up the good work is to become a member of your respective society and do your bit toward pushing things along.[1]

The editorial topics include discussion and comment upon such subjects as the present status of the particular branch of engineering, or of the whole profession at large; upon present practices and methods in certain divisions of engineering; the interpretation of proposed or completed engineering projects; the significant incidents in connection with engineering work; thoughts concerning the engineering profession as it influences and is influenced by the varying conditions of modern life; legislative measures which affect the engineer; the engineer's contribution to his community and his nation;

[1] Editorial, *The Ohio State Engineer*, vol. 5, no. 3, p. 12, March, 1922.

the strong and weak points of his technical education; his ethics. In fact, all the ideas upon which the engineer puts earnest and sincere thought, so that he may improve and strengthen himself in his profession and broaden his relation with mankind, are subjects for the editorial.

The scope of the editorial of a technical magazine is indicated by this one:

Art and the Engineer

To confound those aesthetes who see only dirt and grubbiness and raw utility in what the engineer does, there are artists like Jonas Lie and Joseph Pennell, who find their inspiration in the useful works of man. And though engineers are the most practical of men, there are few among them who do not respond to such artistic appreciation of the things they build and of the way they build them. While the worship of the beautiful can profitably be made the major interest of life only by a minority of the world, no one likes to think that incident to his day's work he is adding to the altogether too great ugliness of things in general. In his secret heart, then, the engineer takes pride in such sketches as the one that graces our cover this week, because it is evidence that a master eye sees in what is a distinctly engineering achievement enough of beauty to put to its perpetuation the skill of a master hand.[1]

The editorial writer generally indicates that he has the quality of mind that belongs to all who have the engineering aptitude of mind. This quality shows in the constructive criticism which the engineer makes. Ordinarily, the technical editorial writer not only takes his facts and diagnoses them fairly, but he also offers constructive comment, so that the reader knows what course of action is reasonable. Because of the opportunity which the editorial affords the young engineer for gaining an intimate knowledge of engineering problems, accomplishments, qualifications, aims, ethics, and aspirations, he should increase his familiarity with this form of writing. He may not be fortunate enough to have friends in the engineering profession to sustain his interest and stimulate his enthusiasm when the scientific routine is most emphasized. At this time, he can gain some of this necessary stimulus and broad outlook from careful and constant reading, and study of the editorial as he finds it in his technical periodical.

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[1] Editorial, *Engineering News-Record*, vol. 87, no. 5, p. 173, Aug. 4, 1921.

COLLATERAL READING

A Pioneer in Reinforced Concrete. *Engineering News-Record*, vol. 89, no. 7, p. 257, Aug. 17, 1922.

The Potential Flying Man Power in America. *Mechanical Engineering*, vol. 44, no. 10, pp. 678–679, October, 1922.

Thompson and Tires: *Engineering News-Record*, vol. 89, no. 7, p. 258, Aug. 17, 1922.

Healthy State of Change. *Mechanical Engineering*, vol. 44, no. 10, p. 679, October, 1922.

An Engineering Anniversary. *Engineering News-Record*, vol. 89, no. 2, p. 49, July 13, 1922.

A National Engineering Museum. *Engineering News-Record*, vol. 89, no. 6, p. 216, Aug. 10, 1922.

CHAPTER XXII

ARTICLES FOR TECHNICAL PUBLICATION

Technical journalism bids fair to become quite as distinct a profession as the other forms of journalism. Special developments require special treatment, but the fundamentals of outlook and of procedure which lie at the root of the special developments belong to all forms. The plan in this book is not to discuss technical articles from the point of view of their mechanical make-up and the technique that is limited to the study of technical journalism. The purpose here is to consider them as one of the channels which may assist an engineering student in his professional advancement.

Articles in technical magazines, obviously, reach more readers than the writer's immediate circle. The ideas of these articles are scattered broadcast among the entire circulation of the magazine. Readers feel that the publication of an article in the technical magazine indicates that the editor vouches for its authenticity. As a result, they do not attach so much significance to the prominence of the writer as they do to the value of his ideas. A nameless engineer, therefore, if he has the material, can gain attention as well as an eminent one. Articles, of course, by prominent engineers carry increased weight. Irrefutable facts, however, are valuable, no matter who presents them. Good ideas, well presented, can always get attention and widen the writer's range of acquaintanceship. If the young engineer has ideas and knows how to express them, he can make the technical article work for him, and thereby become well known.

In considering material that has sales value, it is well to select some particular phase of a topic rather than a general topic. The broad, general discussion is hard for the inexperienced young engineer to handle. It is difficult to give distinction and individuality to its treatment—that is, to select the pertinent details, to see the discussion in its entirety, and, at the same time, to present the material so that it has high attention-getting value. With the simple and definitely limited phase, there are not so many complexities of detail to work through. The limits of the subject prescribe the number of details; hence the article can easily be comprehended and more study can be put upon effective presentation. This narrowing down of a topic is advisable even when the study of the problem has been extended. The brief discussion, under these circumstances, does not represent a scanty statement of practically all the writer has to offer. It is the result of skilful selection of a certain phase, out of a wealth of material.

After the selection of the topic, the next step is a brief, simple outline in a form that is most convenient to the writer, for working plans are needed. This comes only after turning the subject over and over in the mind until he is ready to be articulate. Then he can easily set down his rough sketch. The form this sketch takes is an individual matter. The one requirement is the outline. Though not according to the methods of outlining usually suggested, perhaps the practice of making a short word-outline until the conclusion is reached, and then while the writer is carried along by the enthusiasm and the sweep of the thought to write the conclusion in full, has several advantages. The power that makes the full conclusion easy to do, as the writer sees the whole article before him in rough form, makes it natural and convincing. It also often gives the hint for the opening sentence.

With a definite idea from the outline of the exact limits of the proposed article, and definite knowledge of the coordinate and subordinate thoughts, it is less difficult to write the entire article. At times, it may be well, after the completion of the article, to revise the opening sentence for strong attention-getting qualities. But it is preferable to spend thought and energy in determining the opening sentence during the actual writing the first time. The writer is steadied throughout, when he has stated at the beginning his objective, and has some definite idea of the interest and taste of his readers and some understanding of the scope of his subject. This careful phrasing for the first draft overbalances the effort, time, and the patience that are necessary at the start. Revision ought rather to show that this opening paragraph has been developed in a unified, clear, forceful, and smoothly connected way. Of course, this suggestion should not preclude any rephrasing or changes of the opening which the actual development may make necessary. The best way at the time of revision, however, is to compare the opening with the final sentence to discover how well they agree in the underlying thought. The thought, but not the actual phrasing of the thought, should be the same. Yet, either ought to give the reader a definite impression of what the whole article is about.

The opening sentence, like the summary of the conclusions in the report, should give the conclusions or results in a nutshell. From the first sentence, the reader should get a fair idea of the trend of the article. In other words, this opening sentence should suggest what he may expect in the whole article. The later discussion and the details which should indicate the method of procedure prove or disprove the validity of the writer's conclusion. The last sentence should close the circuit and make the entire article a unified whole. The relation of the opening and closing sentences might be compared to the solution of a problem in mathematics which starts with the theorem and ends with the conclusions over Q.E.D. In mathematics, usually, the conclusion is a precise rephrasing of the theorem. In the article for the technical publication, this exact rephrasing is neither desirable nor effective. For purposes of emphasis and accessibility, it is often the practice to paragraph the opening sentence, and also the closing one. This, however, is a matter of individual choice.

Between the limits of the opening and the closing sentences, the plan of development common to all written discussion is followed. Of course, the technical article should appeal to readers with definite interests. In addition to the selection of interesting subject matter at the outset, therefore, throughout the whole article, the details chosen and the method of presentation must conform with the best practice of the "you" attitude. It is not advisable to select too many details; they will not emphasize but confuse. The writer must carefully choose those which his intimate knowledge of the topic leads him to feel are the most typical and best represent his thought. The selection of the typical details might be compared to the phrasing of the general law after repeated single experiments have been made to get sufficient data to make a law. One may state how many single experiments he made, but he does not describe every single one in detail. He describes the typical one.

There is an exceedingly undesirable tendency among technical writers to use long sentences. To a certain extent this practice is unavoidable, natural, and necessary. Technical material, for accuracy and clearness, often needs many qualifying statements. The long sentence is, in fact, not without its value if it is so handled as to be unified, coherent, and emphatic. A lack of knowledge of correct and necessary punctuation, however, oftentimes makes this unity unattainable. If the engineer is sure that he knows how to handle the semicolon and the subordinate clause[1] with skill and accuracy, then he is perfectly safe in using a sentence of any length. But if—as seems generally the case—he has only vague notions as to the value of these two essentials of the long sentence, then he ought to use the comparatively short sentence —one that does not take more than three and a half lines on the page. The eye can hardly take in easily at one glance more than this number of lines, but the span of the reader's attention is sure for a sentence of about this length. Even in a well-handled long sentence, the thought is broken up into small units, comparable to the single cells in the storage battery. The aim, of course, ought to be to write these accessible sentences on the first draft. This is not the actual practice of the average writer.

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[1] WATT: "The Composition of Technical Papers," chap. V. McGraw-Hill Book Company, 1917.

CANBY and Others: "English Composition," chap. VI, The Macmillan Company.

The reduction of long sentences to those of accessible length is a matter which belongs to the revision; it immediately precedes the final draft of the article. In this revision, the writer must take an impersonal view of his own presentation. He must appreciate when the thought becomes inaccessible through sentence length. He must break up the long, unwieldy sentences at what, after a little practice, he will come to recognize as the natural breaking point or the "joint." Often this simple breaking is all that is necessary to make the thought accessible. If this breaking does not give the expected result, then the writer must rearrange and revamp within new and often narrower limits. The sooner the technical writer is convinced that his long sentence hampers effective communication of his ideas, and learns how to overcome this obstacle to his skill in English, the more easy will his writing become, and the more forceful.

Editing usually is a part of revision. In the first draft, the engineer should center his attention upon the thought and stress in his own mind the need for conveying the thought to others. Few except those most practiced in the art of writing can carry on the two processes of collecting thought and of phrasing it most effectively at one and the same time. Most writers have to divide them into two separate operations. In the rough draft, the primary aim is to collect the necessary ideas according to the plan or sketch that has already been worked out. In the later draft, the primary aim is to determine what methods of assembling will bring the best results. These two processes might well be compared with those used in the production of steel—the mining and transporting of the raw material, and the operations within the mill whereby the ore is prepared for the market.

The engineering student can get some practice in the technical article by writing for his technical college magazine. In this there are all the demands that are present in the writing of the article for the technical publication. The fundamentals are the same. If he were studying technical journalism, he would find certain journalistic terms had been applied to all these various steps that have just been discussed. For the present purpose, however, the more general terms for the fundamentals have been used to avoid confusion and to keep within the range of the present discussion.

Articles by undergraduate engineers, it is true, are not often published in the technical and trade papers; yet there are enough instances to make the ambition worth while and the consideration of the general requirements of technique justifiable.[1] The reason, probably, that there are no more than a scattered few is not because editors have objections to student writers, but because student writers, for obvious reasons, do not frequently attempt work of a nature that would be of value to the readers of engineering publications.

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[1] C. W. Park: How Journalism Is Taught in a Cooperative School. *Engineering Record*, Feb. 24, 1917.

Students in advanced professional courses, however, will find the ambition to publish in the technical periodicals the discussion and results of some bit of research very stimulating. It makes for a broad conception of the possibilities that are open to them through superior professional work, and clear and accurate presentation. Some of these openings for technical articles come from the reports on some original investigation—tests and trial runs—,on first-hand knowledge of some interesting engineering project, reports of professional meetings, accounts of college technical lectures for the engineer's column of the newspaper, special local conditions—even special courses of study. If a student has an opportunity to work with an instructor on some special problem, he has another excellent means of observing the demands of the technical article. By the references which the instructor will make to the student's contribution—even when it has not been sufficient for his name to appear with the instructor's on the title page—he can gain some personal recognition.

When the young engineer is making his observations and gaining his professional experience immediately after college, he is likely to have more material for articles that have publication value than when he was an undergraduate. If he can take the time to work up this material into convincing, interesting, and reliable articles, he may become known to his professional colleagues long before he has sufficient background to become a consulting engineer. For the young engineer, therefore, the writing of articles for technical publications offers early in his professional work an excellent opening for professional recognition. But even if he never gets his article in print, the attempt is not profitless. It gives him one more means of taking the long view upon his subject matter and of getting the "you" attitude. He gains insight into the methods of making his information work for others as well as himself.

COLLATERAL READING

SYPHERD: "Handbook of English for Engineers," pp. 198–199. Scott, Foresman and Company, 1916.

WATT: "The Composition of Technical Papers," pp. 198–254. McGraw-Hill Book Company, 1917.

C. W. PARK: How Technical Journalism Is Taught in a Cooperative Engineering School. *Engineering Record*, Feb. 24, 1917.

R. H. MORRIS and J. R. HOUSTON: An Investigation of the Herschel Type of Weir. *Mechanical Engineering*, vol. 44, no. 10, pp. 651–654, October, 1922.

CHAPTER XXIII

THE ENGINEERING REPORT

The engineering report deserves the most careful, thorough, and extended study which the engineering student can possibly give it. It is the most important form of writing that the engineer has to use in his profession. It is the form that he uses most frequently, but most ineffectively. He cannot get very far in the engineering profession without a thorough knowledge of the aim of the report, and skill in writing it. If he does not get some idea of how to go about it in college, then it is one of the first things he has to learn after college.

In research, in administration, in sales—in any and all kinds of engineering work, in fact—he has to use the report. His handling of his report indicates his grasp of the engineering project, his aptitude, his vision, and his insight. Its value in disclosing to the executive the state of knowledge and the powers of organization of the young engineer is great. Upon his reports, the young engineer is judged as to his ability and reliability. His progress, to a large extent, in the first years after college has a direct relation to his success in report-writing.

The fundamentals common to all reports, in college and after college, are: (1) *Facts;* (2) *Interpretation of facts.* Reports cannot be made upon the assumption of what facts ought to be. Reports must be made upon what the facts are. The first qualification for the report-writer, therefore, is accuracy. He must thoroughly investigate the *facts*. He must extend his observations far enough to collect sufficient data to make for accuracy and completeness. He cannot be scientific, professional, and ethical if he jumps at conclusions. The methods for collecting the technical facts are dependent upon the peculiar conditions surrounding the individual project and are determined by the technical aspects involved. These belong to engineering training and not to English. But the facts gained by the scientific method become effective through the English of the report.

For his report, the engineer will probably take sufficient rough notes—exclusive of the data and other material that are usually collected in tabulated form—to give him reliable information. These notes he uses to refresh his memory when he is ready to consider the best means of presentation for his client. Some practicing engineers suggest that the young engineer, even in his first practice, depend upon mental notes instead of written ones. It is safer, however, for him while he is inexperienced to use written ones.[1] He is not familiar enough, usually, with the general laws that underlie like projects to identify at one glance, much less classify, the individual project as representing a certain type. In his earlier experience, he is forced to treat each individual situation as a separate and distinct problem. Unless he makes some memoranda to refresh his memory, some of the salient details are likely to escape him. His tendency, of course, ought to be to put down fewer as his experience widens.

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[1] A. D. PALMER: Futility of Memorizing Data. *Power*, vol. 56, no. 15, p. 580, Oct. 10, 1922.

He will recall, for instance, how on his inspection trip he examined and noted, as painstakingly as time permitted, the details of the first plant he visited; how he wrote up extremely full notes on this first plant. But, as the trip continued, and he visited more plants, he began to recognize the general features which he could expect in all. So, he wrote in his daily log:

> Visited the B. & W. Co. Similar to the K. T. S. Co. except that safety appliances are more in evidence, and the method of handling the finished product seems better.

His first notes had to be full. He needed his standard, his point of departure. It is not undesirable, therefore, for the engineer, while he is in training, to write down his notes. Records of runs, efficiency tests, field notes, of course, are always put down at the time of the original observation. They, too, furnish facts for the report. They have the additional value of indicating to others the engineer's aim and method.

> An engineer must keep field notes in such shape as to clearly prove his rectitude of purpose.[1]

But the engineer could spend all his time gathering facts—observe accurately and completely—have all the material for a report—yet have no report. The other fundamental requisite is the *interpretation* of the facts scientifically, so that they may be "adapted to the use and convenience of man." Interpretation in the report is faithfully analyzing the scientific facts and seeing their relation and significance to the individual case under consideration. The accuracy of the analysis rests upon the extent of knowledge (theory) and the experience (practice) of the report-writer. But in addition to the interpretation of the facts scientifically, there is need for interpretation of these scientific facts in turn for the benefit of the particular client. The engineer's technical training should make him competent to grasp the scientific significance of his facts. His study of English should increase his competency to make them clear to a particular reader.

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[1] C. R. Thomas: Standing Committee Report, A.A.E., Professional Engineer, Seventh Year, no. 4, p. 8, April, 1922.

The first point that must be considered in the writing of the report for a reader with specific interests is the organization of the scientific facts. In the report, as in any other form of writing, it is well to start with an outline. All reports, both in college and after, cover, to a great extent, the same points. A comparison, therefore, of the suggested outline for an advanced technical laboratory report, and one used for actual engineering practice, with a typical fundamental science laboratory report will demonstrate the similarity of topics. It will show also how the emphasis shifts as experience increases. It will make plain, finally, how familiarity with the topics of the fundamental science outline will aid the engineer in recognizing that, in his first reports after college, he will cover the same points that he did in his college reports. This insight ought to give him assurance that he cannot otherwise expect, and ought also to help him use his time to better advantage than he would be able to do if the whole process appeared as entirely new work.

Reduced to their lowest terms, the various types of report outlines include the following topics:

SIMPLE LABORATORY	ADVANCED LABORATORY	PRACTICING[1]
1. Object	1. Object	1. Brief Summary (*a*) Object (*b*) Results general (*c*) Conclusions (*d*) Recommendations
2. Theory	2. Brief Summary (*a*) Results (*b*) Conclusions	2. Object (*a*) Authority (*b*) Preliminary agreements (*c*) Relevant information
3. Apparatus	3. Apparatus	3. Apparatus
4. Procedure	4. Method	4. Method
5. Results (*a*) Conclusions (*b*) Curves (*c*) Sample of calculations (*d*) Data	5. Data (tabulated)	5. Discussion (*a*) Data (*a*) Results
6. Sketches	6. Results (*a*) Formulas used (*b*) Explanation (*c*) Final (tabulated) (*d*) Curves	6. Leading conclusions
	7. Discussion	7. Tables of data and calculated results
		8. Charts not included under 7
		9. Appendices — details not included in 2–8

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[1] This outline for the practicing engineer's report is based upon the preliminary draft, Power Test Code, A.S.M.E. Committee. *Mechanical Engineering*, vol. 42, no. 12, pp. 719–725, December, 1920.

A careful study of the above table will indicate that the laboratory report, with which the engineering student has become familiar early in his college course, has in it all the points used in the advanced laboratory and in the practicing engineer's reports. These outlines have more headings than the simple laboratory one, yet they do not, with the exception of the *recommendations* of the practicing engineer's report, introduce new topics. With this one exception, these topics are amplifications of the simple laboratory report. As the insight of the report-writer has become more penetrating, as he has become more skilled in handling the technical material and the scientific method, he has given more consideration to the person for whom the report is written. He has taken the topic *results* and has broken it up into as many topics as he felt the interpretation of the facts and figures for a particular reader demanded. So important have the *results* become for his purpose that he has emphasized them by distinct divisions in his outline. Fullness of discussion, therefore, is the most marked difference between the simple laboratory report and the other two. It is not in the topics covered. The simple laboratory report represents better than the other two the logical procedure which scientific investigation must cover. The other two indicate that the logical order is often changed to present most advantageously the points of the report in which the reader is most interested. These other two, therefore, indicate increasing recognition of the "you" attitude.

Theory has not been given prominence except in the simple laboratory report. Theory here is of primary importance, for the engineering student must learn the underlying law as well as be informed that a consideration of the theory is a requisite of any scientific investigation. Theory, to which direct reference is omitted in the other two, is not, however, ignored. It is not given prominence, because knowledge and skill in theory are the points in which the engineer is a specialist, and which he offers as his professional stock in trade. His client's main interest is in the adaptability of the theory which the engineer can suggest, to *his* ends. He wants to feel sure, of course, that the engineer's judgment, as evidenced by his report, is founded upon sound theory, but he does not wish or need extended technical explanation. The theory is included under 7, 8, and 9 of the practicing engineer's report outline, and as explanatory material whenever the discussion makes it necessary.

Recommendations represent the individual contribution which the engineer makes in interpreting the facts so that they possess significance for a particular client and his purposes. They indicate largely the extent to which the engineer has appreciated the peculiar interests and needs of his client and has observed the "you" attitude.

Each engineering project presents, of course, an individual problem; hence the topics of the typical outline must be modified, extended, or rearranged so as to present best the one project. The report of the mining engineer, for instance, will always include some direct reference to location and geological conditions; the special work of the chemical engineer, of the electrical engineer, of the civil engineer will make for a different handling of the report material. At bottom, however, all must consider, if not definitely apply, all the headings listed under the topics of the simple laboratory report. The sooner the young engineer can recognize the underlying fundamental topics, no matter how disguised, the better he can handle his individual report.

Reports of many engineers have been weak because they have not had a thorough understanding of the client's need for their expert knowledge. They have been accurate presentations of technical knowledge, but they have lacked the "you" attitude. But the client rates the specialized information of the engineer only as it affects *his* dividends. The client of the engineer, usually the banker, the owner, the investor, the city council, the board of directors, is interested in the conclusions and the recommendations, not in engineering information in the abstract; the engineer, therefore, must give in his report technical information in usable form so that it has a direct bearing upon the client's aim and will bring *him* profit.

A recent engineering graduate, after experience in analyzing the effectiveness of engineering reports, made this comment:

> The report . . . is not for the benefit of the writer. He must at all times consider the reader and skilfully gage his receptivity. If the report is not well received, it is a total failure, no matter how accurately or meticulously the writer compiled the information.
>
> I confess that this is a new thought to me. Lately, however, I have read numerous reports which left me with the feeling that they were information gathered for the benefit of the writer. (Incidentally, many of these reports cost our company more than $5,000 each.)

Getting the "you" attitude, therefore, into the engineering report is of prime importance. The problem for the engineer becomes one of good salesmanship, for the report requires the same qualities as the business letter:

1. Knowledge of the product, in this case the technical information of engineering and its particular application.
2. Knowledge of the market and of the customer, here the client of the engineer—the financier, the investor, the prospector, the owner—all who rely upon the engineer, with his professional training and judgment, for information and for aid in making a decision.

The engineer can get a definite basis for understanding the client's interests:

1. By making a careful and accurate statement of the object. The object of the report should specifically set the boundaries of the particular investigation as well as suggest the client's relation to it.
2. By checking up all the topics of the report for their direct bearing upon the limitations of the particular project and upon the client's interest in it.

Under this interpretation, the report becomes an argument which will tend to prove or disprove the special proposition set forth in the object of the report. Then, he can actually work out the technical material for emphasis upon the "you" attitude. He can group the several topics of the report into those which must usually be written, and those which must usually be in tabulated form. Obviously, it is in the parts that call for written presentation that the "you" interests are made clear. An analysis of the topics of the report discloses the fact that, while a large part of it is written, some parts are presented in the forms prescribed by the technical procedure of engineering. With the topics of the advanced laboratory report outline as a basis, a survey reveals the following proportions:

Usually written

1. Object
2. Brief summary
   - (*a*) Results
   - (*b*) Conclusions
3. Apparatus
4. Method

Tabulated form

5. Data, observed data entirely tabulated (practicing engineer's outline puts these at the end, and in appendices). Greatest need here for accurate explanatory titles.
6. Results, formulae with some modification—that is, when there is need for explanation of derivation, of method of making calculation along with the sample calculations. Final technical results entirely tabulated. General practice seems to be to tabulate results with only sufficient explanations to refer to the extended computations in the appendices.

Usually written

7. Discussion
   - (*a*) Significance of results (general conclusions grow out of this heading).

- (*b*) Significance of peculiar results (may have some points for the general conclusions).
- (*c*) Significance of anything tending to prove or disprove doubtful data. (Hardly likely to lead to direct statements for the general conclusions).
- (*d*) Statement of laws.
- (*e*) Comparison of theory and standard practice.

Reference to the outline for the practicing engineer's report will show that the conclusions here get more extended discussion and stress than they do in the advanced laboratory one, and that the recommendations are added under the brief summary. Both of these belong to the topics that are written. A comparison of these two outlines will also bring out the additional fact that the parts usually written are more closely grouped in the practicing engineer's outline. In fact they may form a complete unit, without the tabulated material. This rather definite grouping emphasizes this point: *the aim of the report of the practicing engineer is evidently to give prominence to the explanations and the discussion which do not use the code of engineering in the presentation.*

The outline for the written part of the report—that part in which the engineer expects to sell his ideas to his particular client—would generally cover these topics:

1. Object
2. Brief summary
    - (*a*) Results
    - (*b*) Conclusions
3. Apparatus
4. Method

5. Discussion

These five headings include all the parts that depend for their force upon English; that is, all except the brief explanatory comments (in connection with data and results) which are necessary to make clear the formulae and calculations. Diagrams, photographs, and sketches are frequently needed in describing apparatus, but they are for the reinforcement of the English, not as a substitute for it under item 3.

Analyzing these five headings for the general professional forms of writing used, the following are evident:

1. Object, a direct, concise statement, a "water-tight" definition.
2. Brief summary—clear, direct, concise summarizing statements of enumeration, comprehensive and complete, based upon explanation and reasoning. (When recommendations come under this head, they are terse and proved propositions, convincing, logical.)
3. Apparatus, description—clear, accurate, and vivid.
4. Method, narration of the procedure, and description of the processes—clear, accurate, concise.
5. Discussion, explanation—clear, accurate, comprehensive, complete.

The language should be as non-technical as possible and plain to the general reader.

It is not desirable that the engineer be closely bound in his actual writing to identifying the various forms of professional writing that he employs in his report. The value of the above analysis is in a realization of the fact that the report may be broken up into separate units. Each of these has its separate function in relation to the whole. Each is a complete unit in itself and requires distinct handling in order to function properly to produce a unified whole. The engineer, of course, does not write each part separately or treat the various parts as unrelated units; yet he will benefit in his first practice by treating each heading as an unrelated and isolated unit which should be a complete discussion. In other words, he can develop the object on one sheet, the brief summary on another, apparatus on a third, and so on. Then he can collect these sheets and arrange them so as to bring out most advantageously the purpose of the complete report.

As soon as his method is sure, of course, this procedure is too elementary. It is always desirable, however, to see each part in its proper setting. This analysis of what requires the written presentation, what the tabulated and graphic, simplifies the task. It clarifies the aim, and makes the procedure definite. The engineer who can diagnose his own problem in writing, and prescribe his own solution, has increased his power in report-writing, and—far more valuable—his professional assets. For this purpose, therefore, it is desirable to have a knowledge of the written topics and of the kind of development in writing which they require for high-power results.

Good display and layout are as important to the engineering report as to the business letter.

In advertising and selling technical products, a prospectus is a summarized or an extended report, treating the product and its application and service in a technical way. It has for its motive the sale of the product, and it is dramatized by attractive physical appearance, the effective use of illustrations and the proper recognition of the limits of the span of the reader's attention. The sales message and the treatment of it are made to appeal to the individual prospect to whom the prospectus is delivered.[1]

The sentences just quoted had to do originally with advertising and selling the technical product—that is, they were comments in relation to the selling of machinery, equipment, etc. Yet there is the same need in the engineering report for "dramatization by attractive physical appearance, the effective use of illustrations and the proper recognition of the span of the reader's attention."

Display and layout in the report conform to the same general standards as those for the business letter. There is regard for the best arrangement for mass, balance, accessibility, and relation. The sheet used for the report is usually 8½ by 11 inches. The aim is to make the typewritten page look as nearly as possible like the printed page. Sometimes, if the report is extended and voluminous, it is printed. The engineer in his general practice, however, most frequently has it typewritten.

Each separate topic of the report—the object, the summary, the apparatus, etc.—makes a separate section of the report. Each section is indicated by spacing and paragraphing as the divisions in any long discourse are indicated. In addition, the topics can be made more accessible by the use of captions to identify the special division, and marginal titles and subtitles to suggest the subject of individual paragraphs. The words of the suggested outline for the report make good captions for the different sections; the headings and subheadings of the extended outline, those for the marginal titles and subtitles for the paragraphs.

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[1] SLOAN and MOONEY: "Advertising the Technical Product," chap. XII, p. 143. McGraw-Hill Book Company, 1920.

The statement of the object, the results, and the conclusions, because of their importance to the reader, should have special attention. They should give him a bird's-eye view of the whole report. They are comparable to the outstanding features of the aerial photograph. Whenever possible, they should be put on a single page, with the spacing, paragraphing, captions, marginal titles, and the whole arrangement such that the important ideas of the investigation are immediately available. Busy men make no secret of the fact that they want the significant points of a report in brief, convenient form. They do not want to be compelled to go through the whole report to select for themselves the conclusions and the recommendations in which they are especially interested. They wish this application of the actual facts to their particular needs made for them by the expert—the engineer.

The object is included in the section with the results and conclusions, to give the reader the special proposition with which the investigation started and back to which the results and the conclusions lead. The display and layout of the object should be such that if there was no title sheet, the report could be easily identified.

There are, of course, several plans for layout and display of all the material of the report in use. The most important consideration is the mechanical accessibility of the subject matter. The illustration given below for the placing of the object and the conclusions on one page suggests one good plan:

Object: The object of this report is to test a battery of two horizontal return tubular boilers equipped with the Blank Smokeless Fuel Economizer System:

1. To find the comparative rate of evaporation and efficiency of the boilers.
2. To observe the smoke conditions obtaining during two trial runs.
3. And to note the tendency for accumulation of soot while operating the boilers with and without the Smokeless Fuel Economizer.

Conclusions: On the whole, these tests seem to show:

1. That the Blank Smokeless Fuel Economizer is well adapted to meet the needs of the moderate sized hand-fired plant in securing little or no accumulation of soot.
2. That there is a saving of at least 10 per cent of heat energy in the fuel, with a relative saving approaching 20 per cent over the average hand-fired plant as usually operated by the average boiler-room operator.
3. That it utilizes that which otherwise would be waste heat.
4. That it provides a supply of superheated air.
5. That it affords ready means of restricting and regulating the air supply.
6. That it is easily operated and controlled.

In the succeeding divisions of the report, the development of the necessary topics proceeds normally, and usually chronologically.

The report of the practicing engineer is generally bound and always includes a title sheet and sometimes a letter of transmittal. This sheet serves the same purpose as that of any book, with this distinction—the title is a little more accurate, specific, and comprehensive than the usual title page. The letter of transmittal, often bound in with the report, should meet all the requirements for display and layout that have been discussed for the business letter.

The order usually followed in assembling a report is:

1. Title sheet
2. Table of contents
3. List of drawings
4. Letter of transmittal (if one is included)
5. Statement of the object
6. Statement of the conclusions or recommendations
7. The other topics or such of them as are pertinent to the purpose of the client.

All matter that is in tabulated form must, of course, be presented with the proper layout and display. For some of this, there is the conventional form that belongs to the scientific method or can be worked out from knowledge of the scientific method. These matters belong to the methods for recording data in the technical courses.

Display and layout in the engineering report should make possible "reference to any portion with the minimum expenditure of time and effort."

Reports may be classified[1] as

1. *Period reports,* which record and interpret accomplished work.
2. *Examination reports,* which give estimates and forecast future results.
3. *Research reports,* which, as the name suggests, are investigations pure and simple for basic scientific facts. The purpose of securing the facts, however, is not that they may be immedi-

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[1] General classification similar in the main to that of Ralph U. Fulling, in "Language for Men of Affairs," vol. II, part IV. Chap. XVIII–XXV, pp. 267–372, The Ronald Press Company, 1920.

ately applied to some particular engineering project. The aim of the research is rather to discover the general laws and abstract scientific truths which form the basis for applied science. The results of research may be later applied by the engineer in the solving of a particular technical project. But he regards them as he does the other scientific matter which he adapts to a specific engineering problem—fundamentals for special application.

The period report is the one that the young engineer handles first. He is often asked to report upon his daily work, upon limited assignments, or single phases of a project. As it is a record of past and accomplished work, its boundaries are already fixed. It generally involves the engineer and his immediate work. For the inexperienced writer, the period report is often a source of difficulty, because its subject matter is frequently everyday routine, which seems too self-evident to be recorded. As a result, the writer is puzzled to know what properly belongs in it. It requires that he take a bird's-eye view of the whole work, from start to finish, and select the significant details. There is often much compression in the presentation, and herein lies its difficulty. A good period report indicates clear and careful thinking and the power to observe impersonally all the small and seemingly insignificant trifles which belong to daily routine work. The period report is very often used to give information and aid the man within the company in making his decision; hence, since the reader is frequently the superior who understands technical nomenclature, the emphasis is, in a good many instances, upon the details that go to make the record. The conclusions are often left to the reader. The need is for accurate, accessible written and graphic presentation that will make the conclusions easy to get, if not immediately evident.

A number of these period reports, which are often brief, are frequently taken by an executive as the basis for an extended report. They may be regarded, in fact, as small pieces of research which will be used to form items in a larger whole. They are of great value to an executive in making a survey, in keeping him in touch with various sections of work, in giving him a means of judging the value of particular work, in reconnoitering from time to time upon his whole policy, and, finally, in rating the writer of the period report. The young engineer can expect to use the period report often. In fact, it is usually the one which affects his progress for the first five years after college.

As a preparation for the period report, the young engineer on his first job will do well to keep a log of his actual daily task—not what the work was said to be, but what it really is. Just a line or two a day will be sufficient. By this means, even though a report upon his work may never be called for, he has the security of being prepared. He will also acquire for himself a better comprehension of his work. He will discover what it requires of him, what its direction is, what he has to contribute, individually; how he can master it, whether it has a future, and, finally, whether it is congenial. By this log, he can clearly, instead of blindly, determine whether the weariness and the impatience of the first few months of his industrial apprenticeship after college are the natural result of routine, that accompanies even congenial employment, or the discontent that arises from work for which he has neither aptitude nor interest.

The engineering student can test out the value of the daily log to him by keeping a line-a-day record of all that he does in college. By this practice, he can visualize the different divisions into which his college activities fall, generalize upon their direction, get their significance, and use his time to better advantage than he frequently can in spite of his strong and sincere desire. This is probably a better way to systematize and give the right proportions to his work and recreation than to hold himself abstractly to an inflexible schedule. Schedules, unrelieved, take the adventure out of the daily task. With a definite purpose in mind, which motivates the daily task, it is usually more interesting to survey what has been accomplished which will contribute to his aspirations and ambitions in his profession than to be a slave to a set program.

With his daily log as his data sheet, the writer of period reports will find that a good plan is to go over mentally all the points which would be naturally enumerated if he were giving a detailed account of his activities for a day, a week, a month, in a letter. The letter is a good form, because it tends to keep before the writer a particular person as the reader; hence it aids in the selection of significant details. A part of the difficulty in writing the period report comes from the writer's feeling that the reader already knows all that the writer has to record. Yet the writer should never fail to make his report complete. In case the reader is already informed, the report furnishes a memorandum for the reader to use when the need arises.

The report on progress in research in advanced professional courses is a period one. Because there are obstacles or because there is a dearth of material, the student often feels that he has nothing for a report. He has discovered, perhaps, little, and this little is negative. Yet there is still material for his report. He should account for his time, and describe the difficulties encountered. For instance, a student may be assigned the testing of gasoline sold at various filling stations. But during the time allotted he may have been able only to collect his samples. His first impulse may be to decide that he has nothing to report because he has made no tests. Yet the use of his time is important information to an instructor—sometimes as valuable as the actual results. This report will indicate the industry and judgment of the student.

From the point of view of the writer, the skilful handling of the period report offers opportunities for him to demonstrate his ability to see the significance of a completed piece of work. It furnishes, also, an opening for practice on limited assignments in a form for which he has constant use. It strengthens his power to interpret "the common things." There must be always the scientific attitude of mind. The presentation may be informal and brief. The following is an example of a period report:

> The work of the committee is well under way. Reports on the first investigation in each industry were made on February 21, carrying out the time schedule set February 7. At a meeting of the Planning Board held on March 1,

further reports were presented and plans made for continuing the investigations more intensively. These reports were uniformly encouraging, and there is every reason to believe that the investigation will yield information that will have an important bearing on the nation-wide movement inaugurated by the engineer to eliminate waste in American industry. In New York, New England and Pennsylvania the fuel investigation is practically completed.[1]

This report records accomplished facts. It does not give much interpretation.

The examination report is usually referred to when there is extended discussion of the engineering report. It is the one with which the student has some familiarity through his advanced laboratory courses. It is the report of the practicing engineer as an expert. It represents a detailed and thorough résumé of technical investigation on an engineering project. It evaluates facts and gives ample discussion to all the necessary topics. It considers future developments, and its limits are set by the aims of the client. Its purpose is to give information and to aid the client in making a decision. It may be used to give information and aid the client in determining the hydro-electric possibilities at Niagara, transportation facilities in South America, engineering problems in the St. Lawrence River project, the vehicular tunnel under the Hudson River, the proposed bridge over the Hudson, the various super-power zone projects. A large part of the time the report is for the purpose of deciding upon financial investments. Some engineers go so far as to say that cost and dividends are always of prime importance in the examination report. Under all

[1] *Mechanical Engineering*, vol. 43, no. 4, p. 285, April, 1921.

circumstances, at least, the engineer must decide whether the engineering project will be financially profitable as well as technically sound.

The discussion of the engineering outline in the preceding pages has given in detail the points to be covered by the examination report. The formal outline already suggested under the head of the *Practicing Engineer's Report*, with such modifications as are necessary for the individual project under scrutiny, is always used in working through an examination report. Whether or not every point is given extended and complete development in the report that is submitted to the client is another matter. What is presented to the client, and the order in which it is presented, are dependent upon the client's attitude toward the expert, and the use to which he intends to put the conclusions and recommendations of the report. The final report to the client may consist of one page, or of many pages.

Brevity in the report is only in the matter of final presentation, not in investigation. The brief report requires the same careful consideration of the facts as the long one. The material upon which the final report is based should be accessible in case of need. No necessary detail or figures should be omitted in even the brief report. Indeed, it is better for the inexperienced engineer to err on the side of too full than too scant discussion. Since his engineering judgment is just developing, he ought to include enough details to indicate clearly how he arrived at his conclusions. He ought to make sure, of course, that his extended discussion does not indicate verbosity, but is necessary, relevant amplification. The skilled report-writer is often able to convey the idea of the solid foundation upon which his conclusions rest by the way he states them. But the engineering student should condense his reports only after he has grown extremely sure of the reliability of his methods and his premises.

The final and complete report is sometimes preceded by a preliminary one. This usually presents only the object, the conclusions, data, and general results. It is generally intended for the technical member of the company or the technical adviser of the client. Sometimes the preliminary report comes before the investigation and examination are as a whole complete. Enough, however, has been accomplished to predict results and to give conclusive returns upon what has already been completed. Sometimes it may signify that from the data and the results complete in the rough field notes, the parts that can be immediately applied have been selected. Generally, the preliminary report seems to mean that the investigation is complete, the tests have been run, etc., but the calculations have not been extended to their final form; the details have not yet been listed in their entirety; the code has not been sufficiently translated for the non-technical man to use without an intermediary. The recommended action, however, may be taken by the technical man, operation may be planned, and the work started from the preliminary report. Though later developments may change some of the minor matters in the investigation, the conclusions and the recommendations, for obvious reasons, should be alike in the preliminary and in the final report. In the preliminary one, the emphasis is usually strong upon the technical matters of the engineering project—data, formulas, curves—and light upon the consideration of the client's language and understanding. In the final report, the "you" attitude is pronounced. It is not the brevity that makes the preliminary report, but the limitation of the treatment of the results of the engineer's examination.

The technical student too frequently overlooks entirely the immediate uses to which he can put his training in writing his college reports. Too often, he considers his report-writing a burden and wasted time. Yet it is a means of valuable practice in a form of expression for which he will have almost constant use after graduation. Important as are the facts that he gets from his engineering fundamentals, they are not of much value professionally unless he knows how to organize and present them. By means of these college laboratory reports, he has excellent evidence for judging how nearly his reports come up to standard. He can form some conclusions as to how the instructor—whose place, in the first work of the young engineer, will be taken by the first employer—rates his attempts to observe, organize, and interpret the scientific facts of the technical project.

The thesis, required for graduation in some engineering colleges, is an example of the examination report, even though there may be no formal statement of the facts, nor directions given to indicate its report nature. The engineering student, however, will find his thesis writing much less difficult, and much more definite, if he will draw upon his knowledge of the engineering report for layout, and display as well as for the presentation of the written parts.

From the laboratory reports, the student can derive his foundation in scientific method and the rudiments of presentation. Failure to make the most of the practice which these technical reports offer explains perhaps the engineer's weakness in handling reports after graduation. Yet he can proceed through the comparatively simple and brief reports of the fundamental sciences to the more complex and extended ones in his advanced technical courses. From these he can gain a very fair working knowledge of the problems of the report and their handling as he can expect them when he goes out into practical work after graduation. He will also be prepared to write successfully his first reports in the industries if he grasps and masters the underlying principles of all reports.

The report, as the practicing engineer uses it, is the means whereby he sells his professional product—his technical information and experience—to his client. It is based upon the simple laboratory report which has emphasized the scientific method for collecting data. It has been preceded by the advanced laboratory course report in which there has been the tendency slightly, to stress interpretation of facts instead of the theory and the scientific procedure. In its most effective development, the engineering report indicates that the engineer has gathered his material scientifically, has grouped it under the topics that are common to all methods of scientific presentation, and has presented the scientific matter so that the client gets information and aid in *his* problems and for *his* profit. The display and layout should make the material easily accessible. The language should be simple, direct, and appropriate to the particular client. From every side, the interests of the client should be considered. The report gives: (1) The *facts* of the engineering project, and (2) the *interpretation* of the facts for the benefit of a particular reader. The engineer's aim should be to have as clear an understanding of the client's needs and interests, and of the most effective way to meet them, as he has of the technical facts which he collects and interprets.

The requirement for the report stated by the Power Test Code Committee, A.S.M.E., makes a good standard for any engineering report:

> In preparing a report the work should be so done that the report will be self-contained in all respects. The best test of such a requirement is to assume that the report may be brought into court in connection with litigation involving the object for which the test was made. If the report can stand alone under such conditions it may be considered as complete.[1]

Every engineering report should be accurate, clear, complete, and convincing. It should have a definite purpose—to apply certain scientific facts to particular uses and needs of men.

COLLATERAL READING

HOTCHKISS and KILDUFF: "Handbook of Business English," pp. 128–135. Harper and Brothers, rev. ed., 1920.

MEAD: "Contracts, Specifications and Engineering Relations," chap. VI, pp. 106–111, par. 60–65. McGraw-Hill Book Company, rev. ed., 1920.

SYPHERD: "Handbook of English for Engineers," pp. 133–142. Scott, Foresman and Company, 1916.

[1] Power Test Code, *Mechanical Engineering*, vol. 42, no. 12, p. 725, December, 1920.

WINTERNITZ and CHERINGTON: "English Manual for Business," pp. 70–71. A. W. Shaw Company, 1920.

"Language for Men of Affairs," vol. II, part IV, pp. 267–372. The Ronald Press Company, 1920.

The Coal and Metal Miner s Pocket Book, pp. 252–257. 4th ed., 1907. International Textbook Company, Scranton, Pa.

Engineering News-Record, vol. 85, no. 19, pp. 891–892, Nov. 4, 1920; no. 20, pp. 918, 947–948, Nov. 11, 1920; no. 22, p. 1055, Nov. 25, 1920; no. 23, pp. 1102–1103, Dec. 2, 1920; no. 26, p. 1248, Dec. 26, 1920; vol. 88, no. 4, pp. 138, 150, Jan. 26, 1922; vol. 89, no. 8, pp. 308, 317, 325–326, 331, Aug. 24, 1922.

Mechanical Engineering, vol 42, no. 12, pp. 718–719, 725, Dec., 1920. Importance of Expression, Editorial, *Power*, vol. 58, no. 2, p. 61, July 10, 1923.

Railways, vol. LIX, no. 5, pp. 1135–1137, May 16, 1923.

CHAPTER XXIV

THE PROFESSIONAL SOCIETY MEETING

The meetings of the professional engineering societies offer the engineer many opportunities and advantages. Through these meetings, he can have practice in the oral presentation of his ideas. He can become familiar with various and outstanding technical, political and ethical issues that concern the engineering profession. He can gain professional recognition.

During the years in college, the engineering student does not always appreciate what the student branch of his particular professional society may do for him. He is very often only an indifferent member. Yet he has the advantage over students preparing for many of the other professions in that his student society is a division of a national society made up largely of practicing engineers who have his interests and his enthusiasm for a particular branch of engineering. Most student societies, except those among the engineers, have little dealing, much less affiliation with any group out in the actual practice of the particular profession.

By means of the student branch, the future engineer, however, makes his first connection with the engineers out in the world. His interest is extended beyond his technical college and the section of the country in which he happens to be. The occasions, of course, upon which he may personally meet, during his college days, the engineers whom he admires and whom he desires to emulate, are infrequent. But even these infrequent meetings with the leaders are profitable. They are the means whereby the student may become acquainted with the personality of these leaders and visualize more definitely than he otherwise can, his own ideal and his own objective. He becomes familiar with the matters with which these prominent men are connected and in which they are sincerely interested.

A more immediate value of the student branch is the opportunity to study the characteristics and qualities of his fellow students. These men, or men like them, he will meet and work with in the actual practice of his profession. He can get not only their ideas and methods of procedure but also their reactions upon thoughts and proposals which he may present. Here, in the "touch and go" of directed conversation and debate, he can try out his skill in introducing thoughts appropriate to the topic under discussion—not as a public speaker, but as an interested member participating in the affairs of the society and shaping the course of action that will best meet the desires of the group. The practice that the meetings of the student branch afford for the effective oral presentation of ideas, for detecting the underlying issues no matter how much disguised they may be, for gaining poise and composure, and for getting insight into human nature is invaluable. Students, generally, are of the opinion that a knowledge of men as well as of books is very important for every professional man. They are constantly overlooking the opportunities for just this study through the student branch of the professional engineering society.

After the engineer has left college, the benefits of the professional society to him increase. The engineer who continues his connections with his particular society without a break is wise and far-sighted. He starts with some background that includes more than technical knowledge of engineering formulas and methods. He has some professional relations already established, which, if he does his part, may be multiplied as he progresses in his professional experience.

In addition to the acquaintanceship which he may have through the professional meetings of the society, there are two outstanding ways in which he may participate and derive benefit:

1. By presenting a paper before the society on a subject upon which he is able to speak authoritatively, and which will be of interest to his group.
2. By contributing to the discussion which usually follows a paper.

The paper is sometimes a discussion of some technical matter, sometimes, of ways for increasing the prestige of the society through service and leadership. In connection with the subject matter for a paper, there is one important consideration that engineers often fail to recognize, that is, they forget that a compilation of data is not a technical paper but only the basis for a paper. The paper itself ought to present the writer's individual conclusions about and interpretation of the data. Engineers, as well as the general public, want to know what the expert's opinions are. His ideas if they are given in simple, non-technical language, will always receive attention.

In the early years of an engineer's practice, the opportunity to present a paper before his professional society does not often come. He has not yet had the range of experience that is likely to make material for a paper. But assuming that he has, there are certain directions that he ought to keep in mind not only in preparing but also in presenting it:

1. If a definite subject has been assigned, the paper should be definitely limited to that *one* subject. Neither in the writing nor in the actual presentation should irrelevant ideas be allowed to creep in. In the writing, irrelevant matter, of course, breaks the unity, force and clearness of the whole paper. In the actual reading of the paper, it not only breaks the unity, force and clearness, but also takes up more time than has been assigned and hence infringes upon the time set aside for discussion or for other papers. The material, therefore, should be carefully prepared beforehand. It is unfair to take the time of busy people by talking at random from rough notes. Such talks all too frequently give the impression—and rightly—that the speaker is thinking through his subject as he talks and making his conclusions as he goes instead of submitting revised thoughts which are the results of vigorous thinking and which he has taken pains to prepare before he rises to his feet. After a man has prepared his paper, he should

read it as he has set it down, and not add illustrative material extemporaneously as he goes or attempt to reword his statements. All the necessary ideas should have been included in the final draft of the paper, and the reader should limit himself to it entirely.

2. The matter of the time limit is the next consideration. It is hardly ever desirable to go beyond the limit set. In fact, a man should keep well within his time and try to have a minute to spare. It gives assurance and composure. Oftentimes, at professional society meetings, discussion goes beyond the allotted time and the chairman begins to rush the succeeding papers. A practicing engineer who has had much experience in presenting papers before professional groups feels that a man ought never hurry through his paper even though the chairman may urge it. A man ought to do himself justice while he has the floor, that is, of course, assuming that he has kept to his subject and knows that he is well within his own time. A good test of a man's power to hold his listeners is to observe how well he can keep their attention at the end of a meeting or a long series of meetings. It is especially necessary to plan to arouse flagging interest.

When the opening comes for discussion of a paper, the younger man has often as much to contribute definitely as the older one, even though the younger man may not think so. Yet all too frequently, one or two men monopolize all the time set aside for discussion, and ramble along in paths of their own liking instead of talking directly to the point. More people could participate in the discussion, and it would be much more profitable, if a man would set down briefly as the thought occurs to him, the matter which he intends to contribute, as he listens to the papers or the discussions of others. The note may be very brief, but it ought to be definite and complete enough to give a clue that will recall at once the thought which is relevant. Otherwise, the speaker may take undue time in getting his thought under way and fail in giving it proper stress. A brief outline is never out of place.

Some men seem to think that humor and generalities enliven a discussion. Both of them have some times their place, of course if they are used with discretion. But the best discussion which these brief notes will originate, is that which is matter of fact, accurate, concise almost to the point of abruptness, definite and explicit. If the engineer feels that he has something to say and will observe these suggestions for procedure when he contributes to a discussion of any kind, he will not only offer something that is related to the idea or project under consideration, but he will also gain a reputation for being able to speak pertinently and briefly. He will not wear out his listeners with long-winded comments upon points often only vaguely related to the immediate discussion. He will increase his prestige from being able to know when to stop as well as when to keep still.

It takes a good man to know how to talk; it takes a better one to know when to stop.

Another value from contribution to a discussion is that a man will take more interest and give more thought to a meeting in which he is an active participant than in one in which he is a silent spectator. It becomes *his* meeting.

If the engineering student takes the long view upon his future profession, he will not neglect taking part in the student branch of his professional society, continuing in the society after he leaves college and participating as far as he is able in the activities of the group with which he is associated.

A wide circle of acquaintance, a host of friends is the best kind of capital a man can have. It not only adds to his value and earning capacity, but it puts joy into life.

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The redeeming feature of associations that are disappointing in the realization of their declared object of educational uplift, is that they do bring their members together in a relationship that, by reason of their common vocational interest, has something broadening and humanizing and satisfying about it. If the attendant at such meetings brings away no addition to his store of knowledge, no inspiration for his thinking or his work, he is at least richer in the friends that he has made.[1]

[1] F. R. Low: Go to Society Meetings. *Power*, vol. 55, no. 14, April 4, 1922.

CHAPTER XXV

ENGLISH FOR NON-TECHNICAL USES

Reading for technical information is, of course, a necessary and indispensable part of an engineer's practice. The demand for and the benefit of this kind of reading will not lessen. Its range, in fact, will increase. The two editorials which follow indicate what the engineer should expect to get from his technical reading:

It was a great day for the human race when man first learned to record his thoughts and achievements in writing. It was perhaps a greater day when the art of printing made available to everybody who can read the accumulated and accumulating knowledge of the race.

The thinker, the experimenter and the worker can now exhibit their thoughts and achievements to an audience limited only by its own receptivity. The price of admission is that only of a book or periodical.

The work of the world has become so complex, we are doing so many more things than we used to and so many more trained experimenters and observers are searching out new things to do and better ways of doing the old things, that it is difficult for the ordinary man to keep track of the available information even in his own field. Hidden away in books, magazines, and reports are facts, methods, and processes that would lighten costs, improve products, and increase profits were they known and applied. The problem is to cull out of the flood of literature available in libraries and bookstores that which is of possible present or future application and make it a part of one's mental outfit.

We cannot all travel and meet a host of people and obtain personal access to the leaders of thought and achievement, but we can know them and their works through reading. A few shelves of well-thumbed books and a few periodicals, read as they appear and filed for ready reference, will keep their owner informed of the state of the art he follows and in touch with its progress and thinking.[1]

It is not news we need in our reading so much as inspiration. The monkey trait of imitation is a fortunate thing in man. We need to read how other men have succeeded, that we may imitate, not their exact methods, but their persistence, their vision, their energy. We need to read about what they did and how they did it—to get the complete picture. This is not news, but it is inspiration and it will help us to win out.[2]

Technical reading, therefore, is a part of the engineer's professional capital. But the engineer who limits himself to technical reading and seeks only technical information becomes narrow.

The continued study of English has for its main purpose the training of potential engineers in effective speaking and writing, and the enlarging of their interests in human activities generally.[3]

The engineering student often finds difficulty in working definitely toward the second part of the main purpose of his study of English. His time is limited; his curriculum, crowded. The progress and the success of engineering, however, are tied in with "human activities generally." Fuel conditions, dependent upon the relation of operator and miner; transportation facilities, dependent upon the relation of the railroads and their men; operating conditions in the industries, dependent upon labor and financial conditions; waste in industry, and many other economic factors affect the engineer in the practice of his profession. If he would relate his profession to life, he must take active measures to keep abreast of his times. He must be able to adapt and adjust his professional theories and knowledge to the "use and convenience of men and organize the human factors connected therewith" if he is to profit financially and professionally. He must read for information upon "human activities generally."

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[1] F. R. Low: He Who Reads May Run. *Power*, vol. 55, no. 15, April 11, 1922.

[2] Comment, Cover of *Combustion*, vol. 7, no. 1, July, 1922.

[3] M. W. Alexander and D. C. Jackson: Requirements of the Engineering Industries and the Education of Engineers. *Mechanical Engineering*, vol. 43, no. 6, p. 395, June, 1921.

In the limited time at his disposal during college, the engineering student can expect to gain only a knowledge of the sources to which he may later turn. His reading will probably not be more than enough to start him thinking of his future profession in terms of economic, political, and social needs and demands. He must depend largely upon digests, abstracts, reviews, and summaries. When time permits, he will gain by reading in detail some articles for himself; otherwise, he will not develop his power to analyze and relate independently human activities. But whatever his method, the objective must be to keep his general interests alive through the period when the urge of specialization is likely to be most strong. To get the right slant on the tendencies of contemporary life that have a bearing upon his development, to increase the points of contact of engineering with the life around him, the engineer, by the means which he finds most economical for him individually, should read for general information.[1] What he reads, however, is not of so much importance as that he reads.

John Bulter Johnson in "Two Kinds of Education for Engineers" points out the engineer's need for breadth:

> But the engineer has also a personality which is capable of appreciation and enjoyment of the best this world has produced in the way of literature and art; as he is a citizen and a man of family; and, moreover, since he has a conscious self with which he must always commune and from which he cannot escape, it is well worth his while to see to it that this self, this husband and father, this citizen and neighbor, is something more than a tool to be worked in other men's interests, and that his mind shall contain a library, a parlor, and a drawing room as well as a workshop. And yet how many engineers' minds are all shop and out of which only shop can be drawn! Such men are little more than animated tools, worked in the interest of society. They are liable to be something of a bore to their families and friends, almost a cipher in the social and religious life of the community, and a weariness of the flesh to their liberal-minded professional brethren. Their lives are one continuous grind, which has for them doubtless a certain grim satisfaction, but which is monotonous and tedious in comparison with what they might have been. Even when valued by the low standard of money-making they are not nearly so likely

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[1] According to his taste, he can read *The Literary Digest*, *Current Opinion*, *The Outlook*, *The World's Work*, *The Independent.*

to secure lucrative incomes as they would with greater breadth and worldly interest. They are likely to stop in snug professional berths which they find ready-made for them under some sort of fixed administration, and maintain through life a subordinate relation to directing heads who with a tithe of their technical ability are yet able, with their worldly knowledge, their breadth of interests, and their fellowship with men, to dictate to these narrower technical subordinates and to fix for them their fields of operation.

In order, therefore, that the technical man, who in material things knows what to do and how to do it, may be able to get the thing done and to direct the doing of it, he must be an engineer of men and of capital as well as of the materials and forces of nature. In other words, he must cultivate human interests, human learning, human associations and avail himself of every opportunity to further these personal and business relations.[1]

Reading, therefore, that will give him individual satisfaction and that will enrich his personality merits study. The leading engineers of the country indicate through their writings as well as through their conversation and addresses that they have broad interests and are cultured gentlemen. They are conversant with "the best that has been thought and said in the world," know and enjoy fine music, art, and drama, and keep all the avenues of thought open. In technical information and experience, obviously, the young engineer cannot hope to offer as much as the older man; but in information and familiarity with the universal thoughts that have stirred men's minds in all times, he can be on an equal footing, if he has sufficient interest to make the effort. Indeed, there can be no finer stimulus to the best professional instincts of the young engineer than that which comes from being able to have intercourse upon common ground with men of mature experience and culture. There would seem, therefore, to be more than passing value from the study of English literature for the engineer.

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[1] JOHN BUTLER JOHNSON: Two Kinds of Education for Engineers, in HARRINGTON and WADDELL: "Addresses to Engineering Students," p. 32, 2nd. ed., 1912.

The engineering student generally wants an acquaintance with the world's best literature, if he has the time to familiarize himself with it. There are so many technical matters, however, to demand his attention that he frequently decides to leave his cultural reading until a more auspicious time. He does not look to literature for diversion and recreation. He wants action, he wants adventure, he wants athletics. He cannot realize that his interests will ever shift and that he will want to make different use of his leisure hours, ten, fifteen years after he is out of college. He has to take the experience and the word of others to convince himself that he ought to invest for the future by the study of good literature while in college. Of course an interest in music, in art, in drama, will offer the same diversion and recreation as literature.[1] Reading, however, seems to be most universal.

The engineer will gain a definite conception of what reading for appreciation and enjoyment is by considering the two ways in which he may read about his profession:

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[1] See Art and the Engineer. *Mechanical Engineering*, vol. 45, no. 2, p. 141, Feb., 1923.

1. He may read for knowledge of the intricacies of the technique of engineering. His aim is utilitarian. He can gather material from good handbooks, tables, diagrams, and graphs.

2. He may read for the romance of engineering. This crops out even in the narratives of engineering projects, achievements, problems, and aspirations of men engaged in engineering as they are recounted in the technical periodicals. What engineer is not thrilled, for example, by the account of the strenuous fight that engineers made recently to hold back the Mississippi River at flood time. He catches the action of the bare narrative—the hurried call for aid; the quick response; the speeding of machines over the roads which engineers had just completed to the scene of the struggle; the insidious eating of the levees by the waters; the untiring and never-ending effort of the workers, drafted from every available quarter, to re-enforce and build up levees—efforts that at times saved the levees, and at times failed. These accounts are "plain tales of the valley," to use the phrase of the editor of one of the best-known engineering magazines.

Again, the engineer follows tensely the account of the rescue of men imprisoned by a cave-in in a California aqueduct. There was the frantic call for help, the rushing of men to aid, the tireless efforts of the rescuers. Or he may read of the adventures of engineers in remote places and be fired with eagerness to travel. His interest in all these accounts centers around the human element involved, not around the scientific. All these offer the subject matter for vigorous, redblooded literature. If the engineer wants stories that have his chosen profession as the background and the basis of the plot, he will find, with little search, that there are many. They are not all equally great, but they are all interesting. In these stories, whether they are the narratives of actual facts or the imaginings of the writer, the engineer can shake off the dulness of routine that often comes in spite of enthusiasm and interest. He can escape to the romance of his profession and lose himself in the action of the characters and the movement of the events. He can get new interest in the engineering projects in which he works.

Two well-known writers who have given engineering projects literary treatment in stories are Robert Louis Stevenson and Rudyard Kipling. Robert Louis Stevenson came from a family of civil engineers. His father, his grandfather, and his uncle were famous lighthouse builders.[1] He himself could not engage in engineering, because of ill health. But, as he saw the struggles of his father and uncle with the sea as they built lighthouses on the most dangerous and sea-swept parts of the Scottish coast, he caught the adventure and romance of their work. In his story, "The Merry Men," for instance, he describes the region in which his father and uncle worked.

Rudyard Kipling, in the volume of stories entitled "The Day's Work," has used incidents with which the engineer is familiar. For example, the "Bridge Builders," is a vivid narrative of how a new bridge stood the test of a flood; ".007," an interesting story of a new locomotive; "The Ship That Found Herself," the stirring narrative of the maiden voyage of a ship. Some poems of Kipling, too, make reference to the engineer's interests. Take, for example, "The Sons of Martha," and "McAndrew's Hymn." The engineer will get much pleasure out of Kipling and Stevenson.

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[1] ROBERT LOUIS STEVENSON: "Thomas Stevenson: Civil Engineer, Memories and Portraits," pp. 124–134, Charles Scribner's Sons, 1910.

Then there are writers who have used engineering projects as background. Honoré Willsie, for instance, in "Still Jim," has centered her story about one of the irrigation projects of the West. Joseph Husband, in "America at Work," has described romantic features in American engineering development—the high-speed locomotive, the telephone, the steel mill, the great ocean liner, the hydroelectric plant, the coal mine.[1]

Charles M. Tilden in a monograph, "The Romance of Engineering," reviews the early history of engineering, and presents incidents that have high story value. Take, for example, the "Little Brothers of the Bridge"—a religious order which developed during the Crusades to keep the bridges on the road to Jerusalem open and safe for the Crusaders. While no writer has yet used the Little Brothers in stories, the story possibilities are many.

Recently some of the current magazines have published stories for which bridge building, road building, the erection of high steel structures have furnished the setting as well as the situations. In the early days of railroad building in the United States, some interesting stories had plots which hinged upon the problems of the builders in railroad location.

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[1] In art, JOSEPH PENNELL, in his drawings of the Panama Canal, and of the "Wonders of Work" has suggested the use of engineering projects as subjects for art.

The romance of engineering offers many possibilities for the writer and holds much interest for the technical man.

Some engineers have themselves written interesting stories, some related to the engineering projects they have known, more related to phases of life and character which they have observed in the pursuit of their profession. F. Hopkinson Smith,[1] an architect and painter, was also a writer. "Peter," "The Under-dog," "Caleb West," and "Colonel Carter of Cartersville" are delightful reading, though the engineering atmosphere is slight. William McFee, an English marine engineer, has written some good sea stories. Recently he has published "Command," a novel of seafaring men, and also a slender volume of essays under the attractive title, "An Engineer's Notebook." The subjects of these essays are not engineering but touring. Norman Davey, an English mechanical engineer, the author of "The Gas Turbine," has written "The Guinea Girl," "The Pilgrim of a Smile," and verses.[2]

These stories, narratives, descriptions, and poems with engineering atmosphere are not valuable for the technical information on engineering which they may chance to contain, but for their story interests, which offer diversion and recreation. Of course, the engineer wants accuracy in the technical information that is necessary to advance the story. His main interest, however, is in what happens, who did it and where—the details which critics of stories usually designate as plot, characterization, and setting. The engineer is tired. He needs diversion and recreation. He wants to get away from himself. His existence is humdrum, his daily work commonplace. He wants the adventure, the thrill of action, the challenge of struggle, the exhilaration of victory, the appreciation of life as it is, and the escape to life as he would like to find it. In his young, vigorous years probably he seeks his diversion and recreation from the motion pictures, from athletics, rather than as "a pirate of the library lamp who nightly thieves adventure from a book." But as he discovers he may have the diversion and recreation which he craves and which are necessary to well-balanced living, through reading, with more ease and less effort than through the motion pictures and even athletics, he will more and more recognize the value of reading to him when he must live with himself.

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[1] Thomas Nelson Page: Francis Hopkinson Smith (Memorial Article). *Scribner's Magazine*, vol. 15, 1915.

[2] Grant Overton: "When Winter Comes to Main Street," p. 36. George H. Doran Company, 1922.

There is so much to read that the engineer finds the problem of selecting what he shall read a very formidable one. Indeed, it is one which, on the surface, seems almost too complex for his solving. His study of engineering fundamentals has given him little opportunity for the study of books that are not definitely related to his technical engineering course. As a result, he feels that he has not the information to know how wisely to pick and choose his reading if it is not concerned with the technique of his profession. Unfortunately, he has usually so little first-hand knowledge of the best books and stories, or so little training in passing judgment upon them, that he has little confidence in his own critical opinion. When, therefore, he feels the need for more reading upon the urge of recreation or diversion, he does one of two things. He reads promiscuously everything that comes to his hand—good, bad, and indifferent; or he gets some person who has familiarity with the best books and stories, and who has some knowledge of his likes and desires, to start him on good reading.

Either method has its advantages and its disadvantages. There is a great deal of pleasure to be derived from reading, as one comes upon it. With no one to tell the reader what to look for and what he ought to get, he has the thrill of adventure which comes from blazing his own trail and all the triumph that arises from subduing the wilderness with his own bare hands. But there is also a great waste in this haphazard method, because he has to make his own standard as he reads and there is much material that is valueless and not worth the time and energy spent to discover that it is shallow, superficial, if not actually untrue. As a result, it is questionable whether the thrill of blazing entirely one's own trail in reading for diversion and recreation outweighs sufficiently profitless effort over a large range of literature with varying significance.

The best method for the engineer is probably to start with some reading that is conceded to be good; for instance, books that have stood the test of at least a few years, and that will appeal to his tastes and aim; to accept, until he is competent to apply the standards of literary excellence for himself, the opinions of sane, broad critics of books and of life; to read with open mind and to make his own conclusions; and, finally, to measure up his own opinions with those who are more skilled in forming accurate literary judgments. The final products of the reading of literature are the most far-reaching in their influence and yet perhaps the least tangible and the least definite, because they are so dependent upon the individual reader. The engineer will probably be better satisfied with the results of literary reading if he will become familiar early with some guide book which points out what are the definite things that literature may do. Several books may be suggested: C. Alphonso Smith's "What Literature Can Mean to Me;" Sir Arthur Conan Doyle's "Through the Magic Door;" Arnold Bennett's "Literary Taste and How to Form It;" Robert Louis Stevenson's "Books Which Have Influenced Me," "A Humble Remonstrance," and "A Gossip on Romance;" Denney and Raymund's "Good Reading;" and Henry Van Dyke's "Companionable Books." Through the reading of these discussions, the inexperienced reader will get a very definite insight into the satisfactions that the reading of literature ought to bring, some suggestions as to the methods of procedure, and definite references to worth-while reading.

With the attitude of mind toward reading which the study of these books ought to create, the engineering student can proceed directly to that type of literature which attracts his attention first. His approach and his route should be through the type which he likes. He will probably not wish to be encumbered long with the machinery for measurement. In fact, he may gain most by applying Lynn's standard for good books to all of his reading. According to Lynn, A book, to be good must have not only a significant premise, but the writer must also adhere throughout to the significant premise—that is, stick to the truth in situation and character. The novel of romance is likely to be more lasting than the novel of realism, because the novel of romance has idealism which is a real and a necessary part of life. Stevenson's "Treasure Island,"for instance, has lasting qualities because it is founded upon the dream premise—the hope or expectation of acquiring hidden treasure through a man's own efforts. This treasure may be wealth, power, position, happiness. Good books have to do with honor, fidelity, and reverence. Books are bad when honor, fidelity, and reverence are left out.[1]

In reading within the range of "the best that has been thought and said in the world," the engineer may pursue two courses, according to the use to which he intends to put it:

1. He may read those books and magazines extensively that will be valuable to his social intercourse. This extensive reading does not mean that he must necessarily know all the best sellers or all the transient material that the reviewers frequently think holds promise. It does not necessarily mean either that he must not read a great deal of contemporary literature. It will probably be well to do so, since intercourse has generally to do with present-day thought, and contemporary literature mirrors largely—sometimes accurately and sometimes inaccurately—the thought, aspirations, aims, and desires of the times. The best plan for the engineer is to make a selection of those books and magazines which, as far as he

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[1] James Weber Lynn: In a talk, "Good and Bad Books." Given to English Club, Columbus, Ohio, May, 1922.

can judge from what he knows of the publishers and from what he can learn from the reliable reviewers, best represent contemporary thought.[1] Only enough books to give a knowledge of the various types, are probably sufficient for the everyday reader, since so many books have such a brief vogue and leave practically no memory behind them—no more than the feature story of the newspaper.

2. He may do intensive reading of a few for himself, to satisfy himself and to give voice to his own individuality and his own problems. The material for his intensive reading is a very personal matter. The reader need not have the judgment, the interpretation, the methods or the standards of anyone else foisted upon him. He must determine in what form as well as in what individual writings his ideas have been best made articulate. He may find his own interpretation sufficient or he may feel the need for discussion to test out his judgment and to enrich his interpretation. By his discussion with others, he increases the significance of the everyday things about him, and broadens his human relations. Books do most for the reader when they serve him in his relations to people.

If the engineer finds that he cannot concurrently read for social intercourse and for individual satisfaction, then he will profit more by deciding upon the individual, for it can be made to serve both his needs in social intercourse and his needs for self-expression. Intensive reading, which means first-hand knowledge of a few good books and stories by the individual reader is far more valuable than a superficial scanning of many.

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[1] *The Literary Review*, a weekly publication, is an excellent guide for contemporary literature.

The different tastes of readers make some consideration of the most usual types of the *literature of escape* desirable. The usual forms may be roughly classified as:

1. The short story.—This is the Golden Age of the short story. It seems the one form of literature in which America has excelled.

2. The drama.—Much diversion and recreation come from seeing plays, but a large number who see plays do not know of the interest and the stimulation which can come from the reading of plays.

3. The essay.—The essay is of interest to those with a philosophical and reflective turn of mind. It is a pleasure to those whose point of view is mature and who have experienced life.

4. Poetry.—If the engineer is fond of music and has an ear for rhythm, he will find enjoyment in the poetry with the singing qualities.

5. The novel.—The novel ranks probably next in popularity to the short story with the plain, everyday reader.

That the engineer may have something definite to use in measuring these various forms of literature as he comes upon them in his reading, it may be well for him to be familiar with some good representatives of these various types. For the short story, he will find "Americans All,"[1] a collection of short stories of distinctive Americans, a good introduction. From this he will be interested in going to

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[1] B. A. Heydrick: Harcourt, Brace and Company, 1920.

"Selected Stories from Kipling,"[1] and "Selected Stories from O. Henry"[2] and from these typical stories of each of the writers just mentioned to a reading of all of their short stories. After this, as time permits and interest urges, he will find pleasure in reading short stories from Guy de Maupassant, Bret Harte, Hamlin Garland, Mark Twain, Richard Harding Davis, F. Hopkinson Smith, Jack London, James Lane Allen, Thomas Hardy.

The plays of Shakespeare, written in the Elizabethan period, have never been excelled and offer any reader a constant and ever-increasing source of interest, charm, and appreciation. The universality of the themes makes them, in spite of some of the differences in idiomatic English, extremely modern. Interest in the reading of plays has to be acquired. The engineer will gain if he begins with Burton's "How to See a Play" as a guide.[3] This may be followed by the reading of "One Act Plays by Modern Authors."[4] The engineer should be sure to give the reading of plays a fair chance before he decides that he does not enjoy reading them. His familiarity with the spoken drama often makes him feel that the reading of a play is colorless and lacking in vividness of action.

If he will try to assume as far as possible the same attitude in the reading of plays that he assumes when he sees them on the stage, he will get much enjoyment out of his reading. In addition to the attitude of the spectator who is seeing the play enacted before him, he should try as far as possible to read an entire play at one sitting, that is, to spend proportionately the same amount of time upon the reading as he would upon the seeing. By this means, he is likely to get his relative values accurately. Of course, when the engineer reads a play, he has to picture the scenery in his mind, imagine the action from the stage directions, and depend upon his own interpretation of the characters. Both of these impressions may be changed if he sees the play after reading. The reader is sometimes disappointed in the interpretation which the actors give. He finds sometimes that his own interpretation has been exceedingly colorless. If the engineer is at all interested in the drama and enjoys seeing plays, he can have a great deal of real enjoyment from the reading of the plays of Barrie, Shaw, and Shakespeare. He will also find that his appreciation of the plays which he sees will be much keener than before he reads plays.

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[1] W. L. Phelps: Doubleday, Page and Company, 1921.

[2] C. Alphonso Smith: Doubleday, Page and Company.

[3] The Macmillan Company, 1914.

[4] Edited by Helen Louise Cohen: Harcourt, Brace and Company, 1921.

Poetry, to a large group of readers, seems forced and superficial and is often approached very reluctantly. Some readers prefer to avoid poetry entirely. There is so much compression in poetry that the reader finds the thought hard to follow and the imagery hard to catch. But if the poet, as Carlyle thinks, is only the one articulate man speaking for the many inarticulate, then the poet is expressing some thought on duty or destiny that the men of his time are wanting to say, but have not the power of saying. While some readers object to an anthology of poetry, because it has a tendency to give a somewhat sketchy impression of the poetry of any one poet, for the general reader the general collection is exceedingly valuable, especially if the reader recognizes the fact that the selection of the poems in any anthology represents only one man's opinion. "Modern Poetry, British and American,"[1] a recent collection by Louis Untermeyer, is a good one to know.[2] Palgrave's "Golden Treasury" is an excellent one for the English poetry preceding 1850.[3] The engineer should not overlook some of the poems of Kipling, such as "L'Envoi;" the ballads of Robert Service; the "Invictus" and "The Ways Are Green" of W. E. Henley; "The Requiem" of Stevenson; "Prospice" of Browning; "Crossing the Bar," of Tennyson; "When in Disgrace with Fortune and Men's Eyes," Sonnet XXIX, of Shakespeare; the sea poems of John Masefield. A love of poetry is perhaps a little slow of development, but it is worth striving for.

The satisfaction poetry brings in the articulateness that it can give to those who are most inarticulate, but who are sensitive to the various forces of life which play upon them, is inestimable.

For the essay, "Modern Essays," selected by Christopher Morley,[4] offer the general reader an excellent means of discovering what the essay is and what its subject matter and its uses are. These may be followed by essays from Stevenson. A good volume for this purpose is "Selected Essays from Stevenson," edited by William Lyon Phelps.[1] Other essays that will bring enjoyment are David Grayson's "The Friendly Road;" "Adventures in Friendship," "Adventures in Contentment," Dallas Lore Sharp's "The Hills of Hingham;" James M Barrie's "Courage."

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[1] Harcourt, Brace and Company, 1922.

[2] HUBBELL and BEATTY: "An Introduction to Poetry" is another good collection with some suggestions for study. The Macmillan Company, 1922.

[3] E. P. Dutton and Company.

[4] Harcourt, Brace and Company, 1921.

For the novel, there are many which might be used as the introduction. A few will be suggested from which the engineer may choose: "The Virginian," by Owen Wister; "Tom Sawyer" and "Huckleberry Finn," by Mark Twain; "Lord Jim," by Joseph Conrad; "Sentimental Tommy," by James M. Barrie; "Red Gauntlet" and "Heart of Midlothian," by Sir Walter Scott. There is a wealth of material to draw from in the novel as well as in the short story, which has stood the test of years.

The letter is not usually classified as a form of literature, but it is often a vehicle for the short story and the novel. The letters of Lincoln, of Mark Twain, and of Robert Louis Stevenson, however, are literature in themselves and are some that the engineer will enjoy. They are full of good common sense, cleverness of expression, and wit and humor. "A Poet of the Air," a series of actual letters written from France by a young aviator to his mother, during the World War, will also furnish some very delightful reading.[2]

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[1] Charles Scribner's Sons, 1910.

[2] A Poet of the Air. Letters written in the Aviation Service, by JACK WRIGHT. *Harper's Magazine*, vol. 137, pp. 331, 528, 709.

Selections in contemporary literature, as it is found in the current periodicals and recent books, are hard to pass final judgment upon. The reader is too near it to be able to take the long view and get its final value. He can come more closely to a fair estimate if he has a few critical standards for it which have been derived from a knowledge of literature which has stood the test of time.

Indeed, the comparison of one contemporary book or story with another contemporary one cannot give him judgment that is adequate or comprehensive. He will get only slight variations, instead of sharp unlikenesses, and clear likenesses of parts instead of the whole.

Most engineers plan sometimes to have their own libraries. Complete sets of authors are not a necessity, though always desirable. The engineer, however, will probably make his library better meet his needs if he will pick and choose here and there the volumes and the works of the various writers which make the strongest appeal to him. Pocket classics, small volumes which he can slip into his pocket to read at odd moments, are very good ones to acquire. These little books afford the opportunity for the engineer to get at a very moderate sum some of the very best selections of literature.

The suggestions for reading that have been made in this chapter are necessarily very limited and are meant to give the engineer only a starting point in his non-technical reading. Good literature is an ever-renewable and ever-increasing source of pleasure. Its limits are only the capacity of the reader. As soon as the engineer has thorough familiarity with specimens of good literature which will give him some specifications for his reading, he should browse and adventure for himself and make his own choice. The final factors that determine his reading are his taste, his mood, his aim. He will get out of literature about what he puts into it in the way of thought, experience, and desire. But he needs a knowledge of good literature in order to reach his fullest measure of manhood. Darwin wrote in his old age:

> Up to the age of thirty, or beyond it, poetry of many kinds . . . gave me great pleasure, and even as a school boy I took intense delight in Shakespeare, especially in the historical plays. I have also said that formerly pictures gave me considerable, and music very great delight. But now for many years I cannot endure to read a line of poetry; I have tried lately to read Shakespeare and found it so intolerably dull that it nauseated me. I have almost lost my taste for pictures and music.
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> . . . . . .
>
> My mind seems to have become a kind of machine for grinding out general laws out of a large collection of facts . . . And if I had to live my life again, I would have made a rule to read some poetry and to listen to some music at least once every week . . . . The loss of these tastes is a loss of happiness.[1]

The engineer's work, like that of Darwin, is concerned with the grinding out of general laws; consequently he runs the risk of falling into the same pit that Darwin did, unless he makes it a rule to do some good general reading in the realms of literature. Books, which may here be considered as having for their subject matter the material for all the types classified previously—short story, novel, essay, poetry, play—are a necessary asset to the richness of his living and make life tolerable.

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[1] "Darwin's Autobiography," pp. 53–54. D. Appleton and Company, 1913

> As friends and companions, as teachers and consolers, as recreators and amusers, books are always with us, and always ready to respond to our wants. We can take them with us in our wanderings, or gather them around us at our firesides. In the lonely wilderness, and the crowded city, their spirit will be with us, giving meaning to the seemingly confused movements of humanity, and peopling the desert with their own bright creations.[1]

To the end that the engineer may participate in the social life of his community and meet on equal terms the men and women with whom his profession makes him acquainted, that he may get his mind out of its dangerously narrow technical ruts, and gain breadth of vision, tolerance and the knowledge of those things which round out his profession as it has been broadly defined, he must rest his mind by his cultural reading.

A recent communication to *Power*, headed "The Chief Engineer's Bookshelf," while stressing the significance of the engineer's technical reading, includes a comment on cultural reading. It suggests very definitely what use the engineer has for his literature:

> An extensive acquaintance with power plants in various parts of the world has convinced me that the chief engineer's bookshelf in the power plant is a fairly reliable index of the efficiency of the plant. A man is what he thinks, and a man's thoughts are mainly influenced by his experience and his reading.

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[1] The Century Company. Book Catalogue, Autumn, 1921.

The ideal engineer's office bookshelf would contain a book of mathematical tables, a few modern catalogues, some well-known engineer's handbooks, and current numbers of the leading technical journals, with a special place for his own book of notes and clippings. If he can find room for a favorite classic to remind him in times of worry and depression that this is a vast, beautiful world, so much the better.

. . . . . .

It is remarkable how the practice of keeping a good bookshelf increases the interest in engineering generally, and an engineer who has neglected the theoretical and literary side of his job will find that the best way to recover enthusiasm is to begin to build up a shelf of good engineering literature.[1]

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[1] CHARLES HURST: *Power*, vol. 54, no. 24, p. 940, Dec. 13, 1921.

CHAPTER XXVI

THE TWO OBJECTIVES

The engineer should consider English as a study from which he may acquire for every practical purpose remorseless and scientific efficiency in the use of words; a study from which, through his reading, he may gain a glimpse of the cultural things of life.

Of first consideration is the practical value of English to the engineer. It may meet two of his needs. First, careful training in this subject early in a student's college course in engineering equips him to express satisfactorily his ideas in all the courses he may take. In written examinations in papers, in oral recitations, on all occasions he is able to demonstrate that he not only knows but also can express his knowledge. English, therefore, is a tool which can be put to immediate use. Second, college training in English will be of service to a man after he is out in professional life.

Through English an engineer may increase his efficiency. Or, to use the words of a graduate engineer:

> English gives an opportunity for increasing the effectiveness of the engineer's personality; that is, it may be made a means of increasing a man's confidence in himself; it may give him the tools and the equipment for developing himself so that he can make known his greatness.

To be one of the best engineers, therefore; to explain, for example, the engine so that the uninformed, the disinterested will not only admire its mechanical perfection but also appreciate its possibilities as the individual engineer dreams them, one must acknowledge that English is as essential to a technical course as theoretical and applied mechanics. Furthermore, one could cite instance after instance of men who failed to receive the recognition due them because they could not express their own greatness. Indeed, to reach the highest professional efficiency, an engineer must have control of his mother tongue.

A little less tangible but of as much lasting worth as the professional is the cultural value of English. Through the wide range of material which may be incorporated into English study, the engineer can view not only technical fields but also those which are far beyond technical bounds. Indeed, English gives an opportunity for breadth of view at a time when there is no other chance. For English is usually the one subject by which a student may get away from technical subjects or subjects prerequisite to strictly technical study; hence it is a means of escape from the monotony of the purely technical. Many times English offers a student a much more profitable way of resting his mind, wearied by practical studies, than the motion picture or vaudeville.

In English one has the opportunity of learning how to express and set down for future reference his best—those thoughts which are worth treasuring. No one takes time to put into final form his trivial thoughts, any more than he takes time to preserve every newspaper and magazine. These slight thoughts are not the epoch-making ones that dominate his life. But every one, some time or other, has fine thoughts that demand some effective and permanent form of expression.

And, finally, English study gives the engineer an opportunity to prepare for future leisure hours. A prominent man in one of the middle western universities recently pointed out that in the undergraduate days the student should begin the reading which will be the foundation for all of his future reading. Consequently a knowledge of good books and good magazines may aid the student engineer in laying the foundations for a sound critical judgment which will be of service to him in reaching sane conclusions when in future leisure hours he turns for recreation to reading.

In closing, it will not be amiss to enumerate the essential characteristics of the good engineer:

1. Practicability
2. Shrewdness
3. Thoughtfulness
4. Reliability
5. Enthusiasm
6. Balance
7. Imagination
8. Idealism.

Every one of these characteristics, except perhaps the last, has been noted many times before now. Yet frequently the student engineer either has never carefully checked his original capital and has plunged into his engineering course blindly, or else, under the pressure of meeting the immediate requirements, has lost sight of the most important at least of the cardinal virtues. The good engineer, however, is imaginative, and dreams dreams and sees visions, And because he is practical, shrewd, thoughtful, reliable, enthusiastic, well-balanced, he is able to make his dreams realities—realities which are of service to mankind, realities which advance the firing line of his generation.

Someone has said: "Tell me what a man reads, and I'll tell you what he is." For the engineer, this quotation might be modified to read: "Tell me an engineer's final attitude toward English, and I'll tell you what kind of an engineer he is." His final attitude discloses the underlying principles which will ultimately dominate his life. His attitude indicates whether his profession will be ranked with the great professions. In fact, it reveals whether he is a man with ideals and standards—a man who is competent not only to plan and to execute great engineering projects, but also to take his rightful place in his community.

COLLATERAL READING

THOMAS T. READ: The Engineer's Incomplete Mastery of Power. *Power*, vol. 58, no. 2, p. 74, July 10, 1923.

EDWARD THOMAS: Call to Adventure. *Altantic Monthly*, vol. 131, no. 5, pp. 616–617, May, 1923.

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